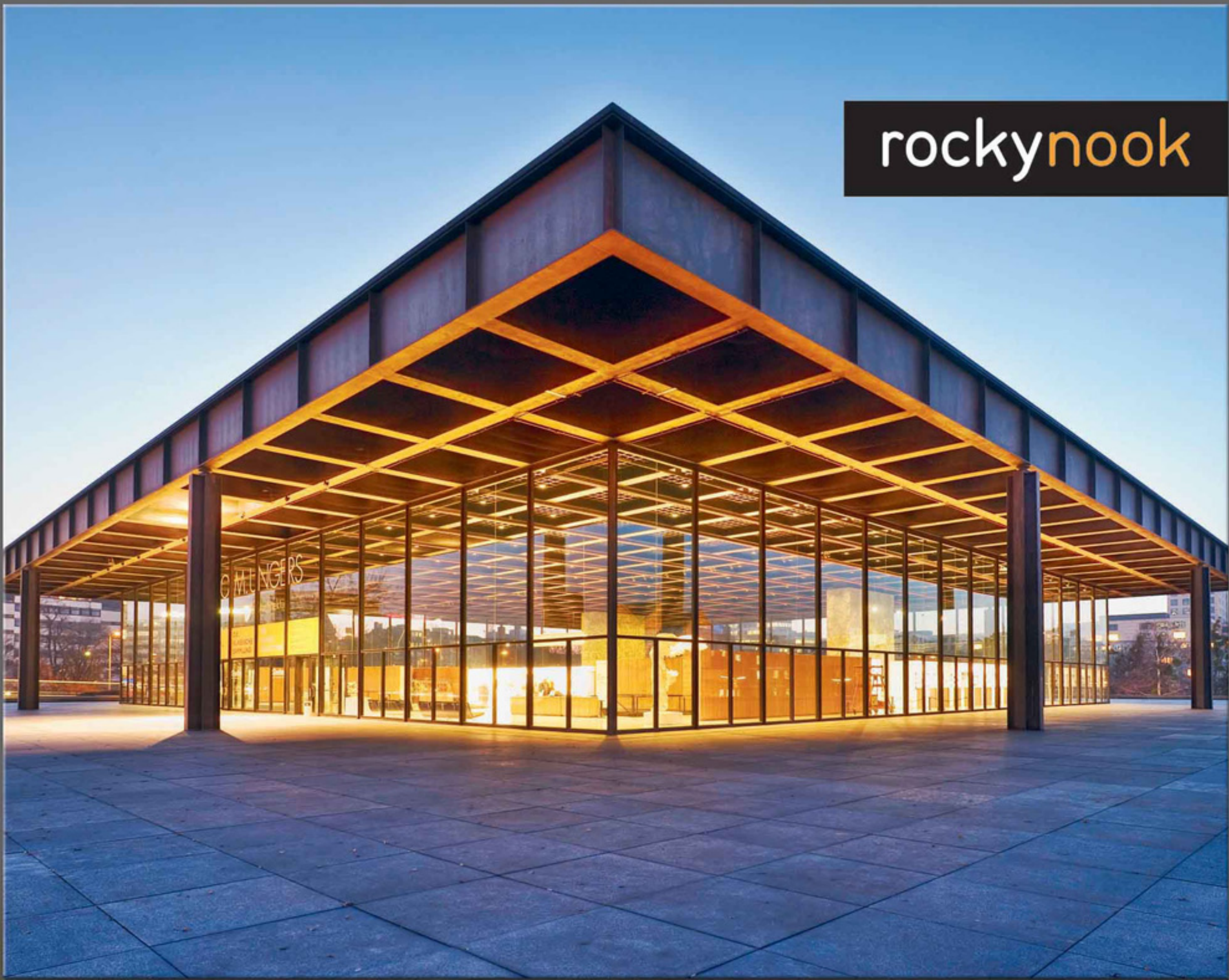

rockynook

Adrian Schulz

Architectural Photography

Composition, Capture, and Digital Image Processing

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with a commentary by Marcus Bredt

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1 Fundamentals

Digital photography is enjoying unexpected heights as more people make use of this modern tool and explore its challenges and possibilities. This new technology has also given a boost to the popularity of architectural photography in particular. The vast variety and fascinating properties of architecture provide inspiration to photographers of all levels. Architectural photographers have endless options for creative interaction with their subjects, which can be captured in an infinite number of ways.

A picture says more than a thousand words. This statement is especially applicable to architectural photography. No other medium can demonstrate the visual appeal and effect of a building better than a masterful architectural photograph. Therefore, the many pictures in this book will familiarize the reader with the topics and explanations not only in words, but also through beautiful examples. The reader will discover answers to many questions arising from theory and practical application, such as: What equipment do I need for architectural photography? What do I need to consider? How can a building look so different in reality as compared to the picture? What techniques can I use to enhance my pictures? What are the options with digital image processing and what can I do with them?

The reader will soon realize that architectural photography has unique characteristics that are quite different from other forms of photographic imaging.

1.1 Architectural Photography: What is it?

Clearly, the term “architectural photography“ is a combination of the words “architecture“ (the subject) and “photography“ (the tool).

The word “architecture“ by itself consists of two Greek words: “arché“ and “techné“. Their meanings translate to “beginning“ or “origin“ and “art“ or “trade“; thus we end up with something akin to “first art“. Architecture is all around us. In its most basic function, it defines our living spaces and is utilized for protection. It is practically the humans’ second skin. The famous architect Le Corbusier once said, “Architecture is one of the most urgent needs of man, for the house has always been the first tool he has forged for himself“. The term “architecture“ encompasses a wide field, beginning with the first shelters of prehistoric man, progressing to ornate temples of the antiquity and functional manufacturing facilities of the industrial revolution, all the way to the glass hallmarks of modern cities. All this is architecture. A world without architecture is unimaginable. Without places to live, sleep, eat, work, do trade, make products, retreat, relax, govern, and learn, mankind would have remained in the Stone Age. Without architecture, the climate in many of the Earth’s regions would be uninhabitable to human life.

The term “photography“ consists of the Old Greek words “phos“ and “graphein“, which refers to “painting with light“. It describes the technical process, by which objects can be optically stored and shown in places they would normally not be visible. Thus, architectural photography carries a building’s image into the world—a world full of photography—in newspapers, on billboards, on the Internet, or even as works of art that hang on a wall.

1.2 The History of Architectural Photography

1.2.1 Early History

Figure 1: Pompeian tapestry, 1st century AD

The history of architectural photography dates back to the 19th century experiments that captured transitory images in photographic permanence. Of course, much older methods have been used to record architecture. The universal importance of architecture for mankind is the reason why paintings of edifices date back to the antiquity (figure 1). Like photography, paintings of buildings strive to compress a three-dimensional object onto a two-dimensional surface. It is notable that paintings do not necessarily rely on actual buildings, as does photography. During the Renaissance, artists such as Michelangelo and Raphael often painted architectural “visions“ rather than depictions of reality (figure 2). During the Baroque period, painting even became a tool and technique of architecture. Wall and ceiling frescos not only depicted

Figure 2: Raffael, “The School of Athens“, Stanza della Segnatura, Vatican, 16th century fresco

Figure 3: Cosmas Damian Asam, ceiling fresco at Ettlingen, Germany, late baroque

Figure 4: Jan van der Heyden, “The Church of Veere“, 17th century, oil on canvas

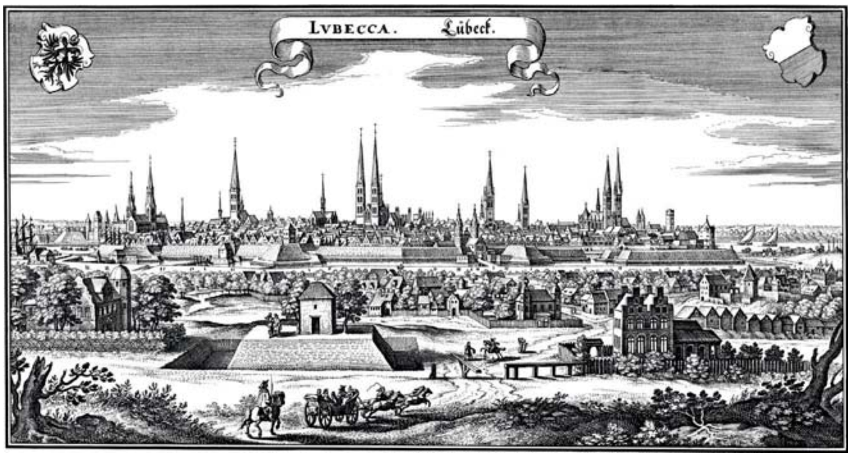


Figure 5: Matthäus Merian, “Lübeck“, 17th century, copper engraving

architecture, but also enhanced and completed it. Thus, the painted surface became part of the architecture itself (figure 3). At about the same time, architectural painting emancipated itself as its own genre, beginning with Dutch baroque art. Town squares and buildings were shown in detail and set in the appropriate environment (figure 4). In addition, other artistic techniques such as the copperplate engravings explored architecture. Especially worth mentioning are the outstanding copperplate engravings by Matthäus Merian (figure 5) with their detailed vistas of European towns. In the 18th century, Italian veduta represented realistic vistas of landscapes and cities in minute detail.

Figure 6: Bernardo Belotto, "A View of Dresden", mid 18th century, oil/ tempera on canvas

Bernardo Bellotto utilized a technological aid in his famous city pictures of Venice and Dresden (figure 6) which dates back to the Renaissance and was also utilized in Dutch baroque painting. It can be viewed as the predecessor of today's modern photographic camera—the camera obscura. During Bernardo Belotto's time the camera obscura consisted of a movable box with an optical system that allowed images to be projected onto a screen, where they could then be traced with accurate perspective and proportions (figure 7), thus ensuring precision in painting and graphical art. Over the course of time, this device was being continually refined.

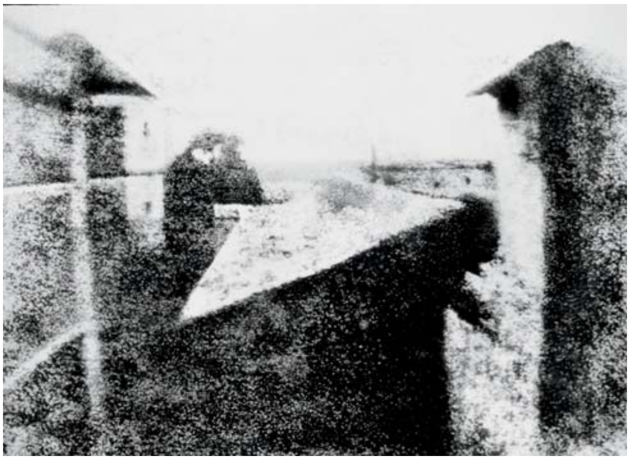


Figure 8: Joseph Nicéphore Niépce, "View from the Window of Study", Chalon-sur-Saône, 1827

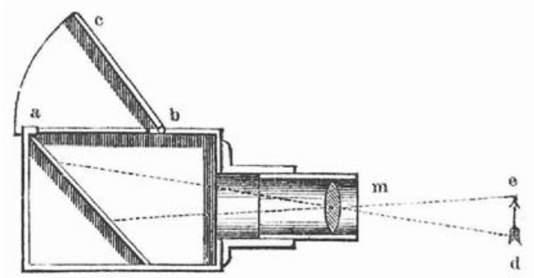


Figure 7: Camera Obscura

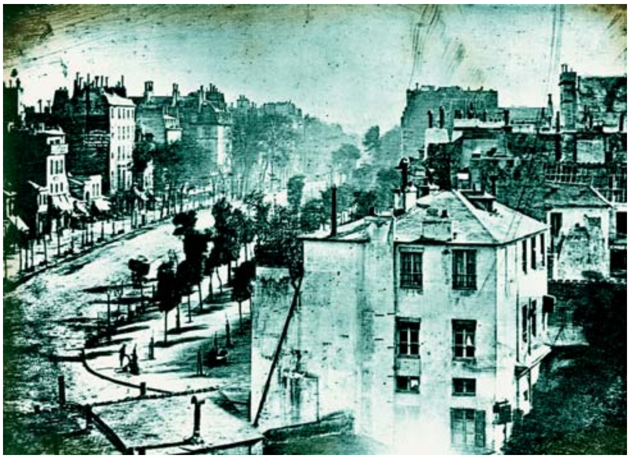


Figure 9: Louis Jacques Mandé Daguerre, "Boulevard du Temple", Paris, 1838

1.2.2 The Invention

With the invention of the camera obscura and the discovery of light-sensitive materials in the 18th century, the fundamental necessities for photography had been created. And yet, it wasn't until 1827 that Nicéphore Niépce first captured the faint image of a camera obscura onto a light-sensitive sheet of asphalt; a process that took several hours. The process became known as heliography and the resulting pictures were called heliotypes or niepcotypes (figure 8). The first of the preserved images shows a basic element of architectural photography: a rendering of perspective. We might consider it to be the first architectural photograph, even though the view from the window of a study can hardly claim to be artistic, but is more practical in nature. The necessity of extremely

long exposure times made it impossible to depict anything but stationary objects, therefore in addition to still lifes, the depiction of buildings was ideal for photographers at the time.

At about the same time, Louis Jacques Mandé Daguerre and William Henry Fox Talbot were experimenting with other processes that shortened the required exposure times to several minutes. Daguerre's street scenes became famous (figure 9), and thus the term "daguerreotype" was coined. Each daguerreotype was unique and could not be reproduced. Talbot's calotypes, on the other hand, could be duplicated because the process was based on a transfer from a negative to a positive; the downside was the lack of detail in comparison to the daguerreotype (figure 10).

In successive years, photographic technologies saw explosive growth (figure 11), and in 1841 the first photographic exhibit of the world's most famous buildings was introduced in Paris. In the second half of the 19th century, architectural photographs gained in importance and were prominently featured in books and magazines about architecture. For example, photographs were used to document the disassembly, transport, and re-erection of Joseph Paxton's glass palace, as well as the construction of the Eiffel Tower (figure 12). Architectural photography also portrayed monumental buildings and estates around the world, as it documented and presented the structures and grandeur of foreign countries. Because of photography's primary use for documentation, architecture was usually depicted in a conservative, heavy, and static style.

1.2.3 The 20th and 21st Centuries

With the architectural changes after World War I also came changes in the way buildings were photographed. Beginning in 1919, the Bauhaus movement founded by Walter Gropius began to view photography as an applied art: "the ideal combination of craftsmanship, technical progress, and artistic expression". German photographers such as Albert Renger-Patzsch, August Sander, and Karl Blossfeldt founded a style they called "new objectivity". In the U.S., artists such as Walker Evans found subjects in the form of buildings reduced to their

Figure 10: William Henry Fox Talbot, "Boulevard des Capucines", Paris, 1843

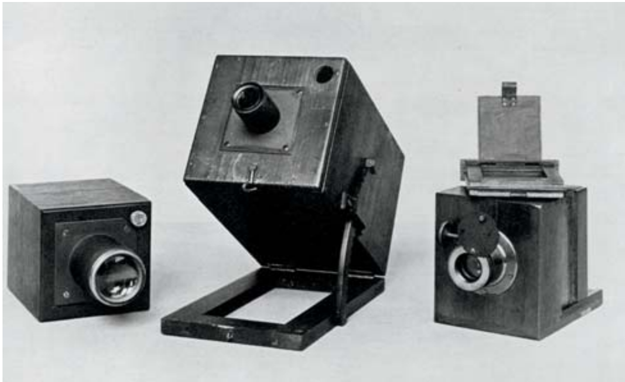


Figure 11: Cameras, mid 19th century

Figure 12: Pierre Petit, Construction of Eiffel Tower, Paris 1888

functionality, such as grain silos and factories. Carefully chosen picture composition along with unusual views created a dynamic quality, and textures drew attention.

In subsequent years, technical progress greatly improved the photographic quality of architectural photographs. Exceptional photographers such as Andreas Feininger experimented with cameras they built themselves. Feininger even invented new techniques and constructed the largest telephoto lens available at the time. In the years before World War II, small and mobile cameras became widely available, which increased the tendency toward subjectivity (figure 13). Photography as a tool became available to a wider sector of society while at the same time becoming more versatile in its application. This gave rise to photojournalism and photo essays, where the camera turned into a visual notebook for photographers.

Figure 13: Leica II, 1932

In the early 1950s, more artistic architectural photography began to reemerge. For instance, German artists like Hilla and Bernd Becher began to systematically show generic photographs of industrial society. Even decaying industrial edifices were archived and arranged in sequences. These burgeoning sequences and collections quickly gained worldwide appreciation. At that point, there was no longer a distinction between so-called “good“ and “bad“ architecture, and even deviations from the accepted ideals of “beauty“ and “modernity“ became the target of photographic lenses. Around the 1970s, a great impetus came from the steady rise of photographic galleries and the massive production of artistic photo books. Whether old or new, within collections or by themselves, familiar or strange, there seemed to be no limit to the range of photographic subjects.

The photographic boom continued toward the end of the 20th century. International exhibitions traveled around the world, and photographs demanded high prices in auctions. Advances in computer technology began to add new possibilities for post-production, such as the perspective control. At the same time, the traditional uses of architectural photography—documentation of edifices for architects, trade publications, the media, and so on—remained important, but were influenced by “creative“ photography. As a result, architectural photography walked the line between artistic and utilitarian applications.

The rise of digital photography at the turn of the century has not changed architectural photography in and of itself, but rather constitutes an innovation in its methods and possibilities. Today’s digital technology has overtaken analog 35mm format photography in terms of sales; and even in medium format photography, digital camera backs dominate the market. However, in large format photography, analog film still remains a few steps ahead of digital technology despite its high costs.

1.3 The Authenticity of an Architectural Photograph

Just as there are different approaches to architecture, ranging from the purely functional to applied art, there is a wide range of approaches to architectural photography. These extend from neutral, documentary depictions to abstract and artistic visual works.

The straight documentary path is a narrow one. It must objectively and matter-of-factly convey the general impression of an on-site observer, and it must render an authentic representation of a building's architectural features (figure 14). This necessitates a focus on conveying information; otherwise, the building itself would lose importance in favor of the photograph representing it.

Of course, this gives rise to the question of whether it is even possible to produce a completely authentic architectural photograph. It is clear that even when a photograph is solely built on realism, there are always elements of abstraction and subjectivity. Such unavoidable factors include the lack of

Figure 14: Documentary architectural photograph

three-dimensionality in a photograph as well as the impression of sizes not being true to scale, depending on the actual distance of the objects. It is therefore practically impossible to depict a building with absolute authenticity. Another factor is that subjective, on-site impressions can only be transmitted with certain distortions: in other words, there is usually a big difference between standing in front of a building and looking at a picture of it. The renowned architect Meinhard von Gerkan expresses this well in an essay published in 2000 in which he states, "The architectural photograph is especially suspect of being an optical lie, because of the inherent potential of photography to be objective, which lends to the assumption that optical lenses are technical apparatuses incapable of being compromised. We know that this is deceptive and untrue".

So, at what point does architectural photography become an art form on its own, and what is the distinction between artistic and documentary architectural photography? It stands to reason that there is no sharp demarcation; rather, the two areas flow into each other. As soon as the photographer shifts the focus away from documentary purposes, one can already see the beginnings of artistically creative photography. Even the selection of subjects may not be limited to a central staging of the building. In such pictures, a building may be the main subject, but the picture may convey little of the building's actual function. In that case, the reliance on architecture becomes less pronounced, and the need for objective depiction is diminished. Following this train of thought, architectural photography can even represent a building in such a way that the resulting picture becomes its own expression, separate and different from the building on which it is based. At this point, the measure of the artistic quality of the picture is no longer the building it depicts, but rather its artistic message. Photographically creative techniques such as the omission or highlighting of features, simplifications, alterations, or optical effects can alter the image to the point where architecture is reduced to the photographer's "toy". In these cases, we certainly see the hallmarks of art (figure 15).

1.4 Manifestations of Architectural Photography

We all encounter architectural photography in many parts of our daily lives. Following are some examples of the most common photographic categories.

Documentary-style architectural photography: Many such pictures are found in photo books, trade magazines, brochures, and in the documentation of construction sites. In most cases, these pictures exist as part of a series and are complemented and accompanied by explanations, drawings, or blueprints. All of them describe the building and are dedicated to the purpose of giving an accurate account of the building's specific properties.

Figure 15: Artistic architectural photograph

Postcard photography: Postcards show architecture in similar ways, even though there is a different level of precision and intent. The exact representation of a building is less important to the consumer than the visual proof of having been at a particular place. As a result, these pictures are usually based on recognition values. Colors often have unnatural saturation, effects may be exaggerated, and photographic rules may be lost.

Vacation photography: The motivation for tourists taking pictures of edifices such as churches, castles, and landmarks is often to take away personal mementos. Although architecture forms the subject here as well, an actual building is much less important than the location or place where it stands. It is interesting to note that such pictures are usually taken while on vacation, but in everyday life and at home, comparable buildings will often be photographically ignored.

Advertising photography: Another application of architectural photography is advertising via billboards, newspapers, and television. Architecture is used to frame products in an advantageous context for the marketers. Modern architecture, for example, can associate a product with values such as "futuristic", "high-tech", "valuable", or simply "cool". The automobile industry especially uses this technique. In many cases, the base picture is significantly altered with colorization, halos, and reflections.

Artistic architectural photography: Architectural photographs with artistic values are displayed in galleries and exhibitions. In most cases, the exhibitions showcase a particular subject or a particular photographer. Architecture is only a means to an end, and the photographs' expression is decoupled from what the building originally conveyed. It is the photographer rather than the architect who becomes the creative artist.

2 Photographic Technology

In this chapter you will find information about the assembly of photographic equipment necessary or useful for architectural photography. Taking into account individual needs and ambitions, I explain which criteria should be considered when choosing a camera, and which combinations of lenses and accessories are best suited for a variety of architectural subjects.

It should be noted that there is no need for a great deal of technical equipment to produce acceptable results. A skilled photographer will be able to make fascinating shots with simple camera equipment, while others may not be able to produce similar shots with even the most sophisticated and expensive equipment. Expensive gadgets cannot automatically guarantee a good architectural photograph. The human operator behind the camera is always the most important factor. The camera is nothing but a tool to produce an image of the actual thought behind it. The noted photographer Andreas Feininger has expressed this as follows: "The fact that a technically deficient photograph (speaking in a conventional sense) can have a higher emotional impact than a technically impeccable image may be shocking for those who are naïve enough to believe that technical perfection determines the value of a picture".

On the other hand, equipment customized for the individual needs of a photographer makes things much easier and is the ideal foundation for good results.

2.1 Comparison Between Analog and Digital

The choice between analog and digital camera systems is the most fundamental decision to be made. In this day and age, when the sales figures for digital technology have far surpassed the older analog systems, the answer seems clear. What advantages does the analog camera still have? The answer is complex, and it is important to understand the differences between the two systems.

2.1.1 From Exposure to Picture

For many decades, analog negative and slide film were the only options for capturing photographs. Amateurs usually made use of the widely available and uncomplicated 35mm film, while serious photographers utilized medium and large format film and cameras. The latter held especially true in architectural photography.

Analog film material is both the light-sensitive material for capturing an image, as well as the storage medium, which differs from digital technology. Film records and stores image information via chemical changes in light-sensitive emulsion. After exposure, the light-sensitive material must first be developed and then converted into a stable and no longer light-sensitive form. In the case of negative film, first paper prints have to be made to create a positive image; in the case of slide film, the single frames can directly be projected as positive images onto a silver screen. This complex process is usually referred to as "developing". But to be exact, the developing process is only the conversion of the not yet visible, latent picture into a visible negative or positive, and therefore developing is only a part of photographic film processing. After the film is developed, it is put into a stop bath to end the chemical reaction, followed by another bath to stabilize the film into a permanently lightproof form. This is followed by washing with water and drying. Finally, negative film can serve as a master to expose light-sensitive photo paper to produce paper prints, and it can be cut for archiving. Slide film, on the other hand, is usually used for projection.

By comparison, the digital process is much less complex. The most significant characteristic of digital pictures is their immediate availability. Electronic data from the camera's image sensor can be stored and processed immediately. No film has to be purchased, there is no delay as a result of film processing and digitizing, and pictures are immediately ready for viewing and printing.

2.1.2 Film Grain vs. Digital Noise

Analog film material is available in many different levels of sensitivity. Because of the increased size of silver crystals, higher light sensitivity also means more grain, which is a typical film phenomenon. Even though the optical grain of

analog film has completely different causes than the electronic artifacts known as "noise" that are produced by a digital image sensor, both are similar in appearance. There is one important difference, however: film's graininess is normally simple and harmonious (figure 16), but the noise of an image sensor at high sensitivity settings often results in colored spots ("color noise", figure 17) and striped phenomena in dark sections (i.e., "pattern noise" or "banding", figure 18). These effects are usually perceived to be more unpleasant than grain. Although images from digital SLR (DSLR) cameras at the same sensitivity settings produce less visual noise, quite a few people regard analog images as more natural and harmonious when compared to the generally flatter, more sterile, and artificial-looking digital versions. Part of the reason is that visual irregularities in natural structures synchronize better with the uneven and chaotic distribution of silver crystals on film, as opposed to the geometric grid lineup of pixels on an image sensor. Many photographers even use the film grain as a stylistic tool, so it is not surprising that software designers are trying (with varying degrees of success) to recreate the look of analog pictures in digital formats.

Furthermore, "noise", or the lack thereof, is strictly relative and very much determined by each viewer's perception and awareness. One easily gets used to one or the other. A photographer who only takes digital pictures may be shocked and displeased by the first impression of digitized analog pictures as seen in picture processing software. On the other hand, one has to realize that graininess in printed form is usually much less noticeable than it would be to a critical eye and merciless inspection on a computer screen.

Figure 16: Appearance of film grain

Figure 18: Striped artifacts called "banding"

Figure 17: Typical "noise" from a digital image sensor

2.1.3 Resolution and Range of Contrast

If only image quality is considered, many believe that analog film images are still superior to digital images. When used in combination with high-quality digitizing devices, images created with analog large-format cameras on negative and slide films can deliver a resolution and data density beyond what digital cameras are capable of (figure 19).

In addition, negative film stock has a dynamic range of 12 aperture stops and more, thus capturing a much greater range of contrast. In a difficult and contrast-rich environment, film is much less temperamental to work with; and especially in highlight areas, film offers more leeway than most digital cameras. With digital systems, difficult lighting conditions will often produce clipped tonal values, e.g., blown-out highlights or clipped shadows without image detail (figure 20).

However, at low sensitivity settings, all medium format digital cameras and some top DSLR cameras (which usually have full-frame image sensors) are capable of at least a dynamic range of 11 aperture stops. If RAW format (section 4.1.1) is used, dark picture areas can be significantly improved. On the other hand, due to the fact that the available dynamic range (the ability of a camera to capture shadow detail and highlight detail at the same time) depends on pixel size, digital cameras with small image sensors lag behind with no more than about nine aperture settings. On a side note: Slide film is very sensitive to strong contrasts, therefore, its dynamic range is about the same as a digital compact camera with a small image sensor.

Figure 19: Digitized large format shot with a resolution of 10,000 x 8,000 pixels (80 megapixel), enlarged segment (Photograph: M. Bredt)

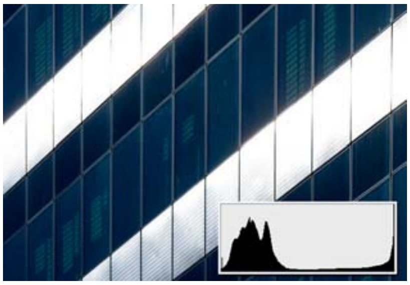


Figure 20: Blown-out highlights in a digital image

2.1.4 Image Aberrations

Unlike digital photography, analog photography is not afflicted by image problems such as moiré, color shifts, or aliasing effects.

The **moiré effect** (figure 21) happens when various grids or lines overlap. This phenomenon occurs with most digital cameras when fine, repeating patterns on the subject align with the geometric pixel layout on the image sensor so that they interfere with each other. In such cases, image sensors built according to the Bayer principle (see page 16) can also produce **color shift**, because each color value must be interpolated with the pixels next to it (figure 22). The geometric pixel array on the image sensor is also responsible for an effect called **aliasing**. This effect happens when lines or edges run through the pixel array at an angle, which may produce stair-step-shaped patterns where there should be a smooth line (figure 23).

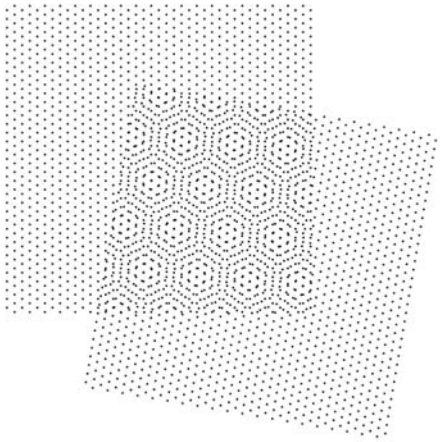


Figure 21: Moiré as a result of two layered grids

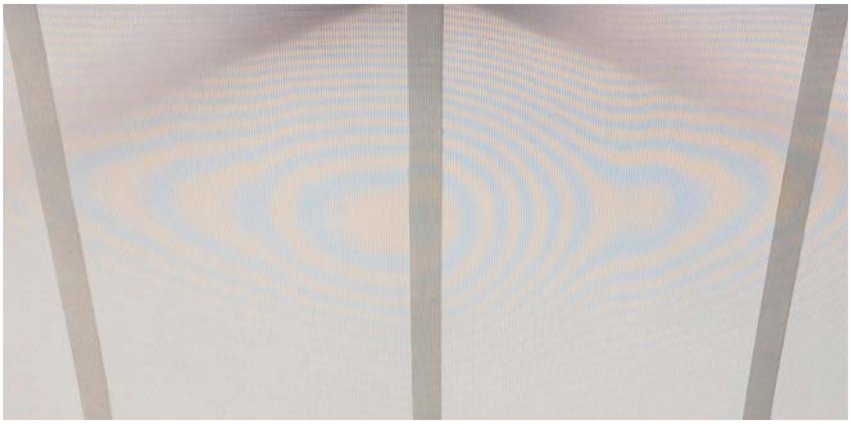


Figure 22: Moiré and color shift in digital image

Figure 23: Aliasing causing staircase-like effect

In order to reduce these errors, most camera makers place one or several anti-aliasing filters above the image sensors. Simplified, their function is to slightly blur the image similar to the effect of a soft-focus lens, whereby the aliasing effect is minimized. Of course this happens at the expense of fine details and reduces the theoretically achievable resolution of the image sensor. Every camera maker must find a compromise between high resolution and minimal image aberration.

Analog film material doesn't suffer from any of these afflictions because its microscopic silver crystals are randomly distributed, have different sizes, and—in the case of color film—are layers placed on top of each other. (This is not the case with the widely used Bayer-type image sensor.)

Bayer Sensor, Bayer Interpolation

Each sensor pixel detects only the brightness of one dot in the image, but not its color. To generate a color image from a digital sensor, three color values are needed for each pixel: red, green, and blue. In the so-called RGB (Red, Green, Blue) color definition, almost all colors occurring in nature can be defined by a combination of these three prime colors.

To obtain color information from a digital sensor, a number of technical methods have been devised. Color filters must be used in order to separate visible light into its color components. Three-shot cameras photograph the subject three times using red, green, and blue filters in front of the sensor. The three images are then merged into one.

Our "regular" digital SLR cameras are only "one-shot" cameras. But if only one shot is taken, the sensor pixel can only record the intensity of one color component. Therefore, a trick is used to gain the missing two color data sets. A filter matrix consisting of alternating red, green, and blue filters in pixel size is placed on top of the sensor. This does not change the fact that each pixel only records one color value, but it makes it possible to calculate the missing color data from the adjacent pixels. This process is called "interpolation".

In general, digital cameras use the so-called "Bayer matrix". 50 percent of it consists of green, and 25 percent each of red and blue filters. Four pixels form a group, in which one pixel records red, another blue, and two pixels record green light. The green is doubled, because the human eye has more sensitivity for green. Bayer interpolation means that the real color values of each pixel are calculated by incorporating data from the adjacent pixels. Therefore, each dot in the converted image also contains color information in a part of the light spectrum for which it is not actually sensitive.

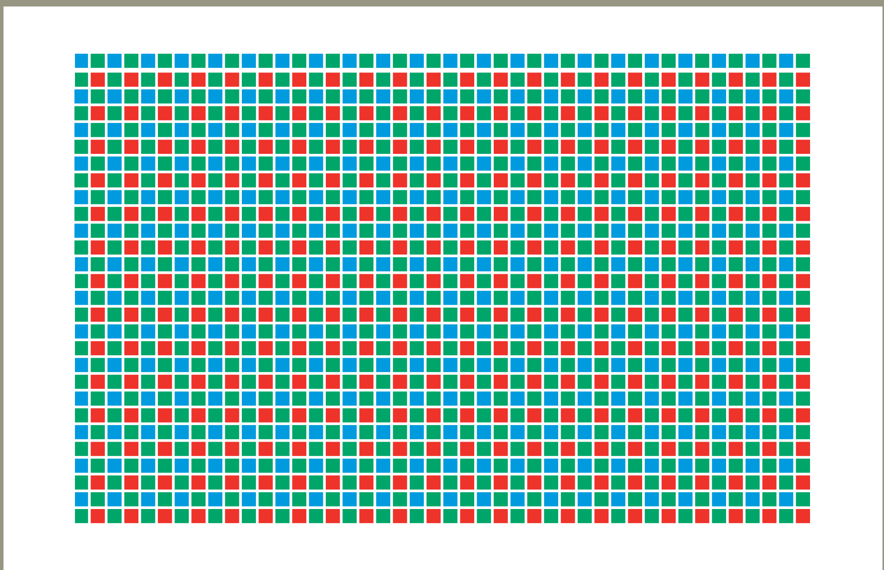


Image caption: Filter matrix structure of a Bayer sensor

2.1.5 Consequences of Lens Quality

Photographers who own both analog and digital SLR cameras may notice that analog cameras are generally less sensitive to lens quality. One reason is that chemical film does not have a problem with light coming from an angle. A digital image sensor is much more likely to be disturbed by light coming from an angle. This is especially the case with wide-angle lenses where light rays impinge on the outer edges of the image sensor in an acute angle. Imaging errors and vignetting often result. Of course, many manufacturers seek to circumvent this problem with special micro lenses, which are placed above each sensor pixel and can therefore focus sideways light. In addition, all new lenses are being designed with this problem in mind, and in some cases digital in-camera processing immediately after the exposure also reduces the effect.

2.1.6 Ruggedness of the Camera

Figure 24: Dust particle on image sensor

Figure 25: Fine hair on film

In many cases, analog cameras are deemed more rugged and reliable than their digital counterparts because analog technology is less complex and more economical to manufacture. A small battery often lasts a long time, and some older camera models function completely without batteries. Furthermore, analog cameras are far less sensitive to dust. Dust particles cannot permanently stick to the light-sensitive medium, as is the case with digital image sensors, including the most recent models with ultrasonic cleaning systems (figure 24). There is no need for difficult and elaborate sensor cleaning procedures with chemical, 35mm format film, since debris is simply swept away when the film winds forward for the next exposure. Of course, this is not to say that analog cameras don't have problems with dust at all. One complication is that when analog film is scanned, it is necessary to be extremely careful to avoid dust contamination on the film material (figure 25). Because this is not always possible, it often becomes necessary to clean the film before scanning, which is especially an issue with large format film. Modern scanning devices for 35mm format film often come with software that automatically removes visible dust and scratches from the scanned images.

2.1.7 The Functional Life of Digital Cameras

Compared to their digital counterparts, analog cameras retain their value for a much longer time. Within a matter of years or even months, digital camera models may become quickly outdated and replaced by newer models. Rapid technological developments can render today's digital camera obsolete before the next day. Of course, this does not mean that older digital cameras are useless, but many photographers will be seduced into buying new and often more expensive cameras.

2.1.8 Number of Exposures

A basic trait of analog cameras is the necessity to reload film after a set number of exposures. 35mm film cartridges can hold up to 36 exposures, but large format film must be changed after each exposure. Digital cameras, on the other hand, can store many more pictures on a small memory card. This also means that poorly exposed shots are no longer a great annoyance. After an evaluation on the camera's LCD monitor, unacceptable images can be immediately deleted. Theoretically, shots of a subject can be taken until the perfect moment or angle has been captured. In analog photography, such an approach can easily become a burden on time and budget, because several films must be purchased and processed.

Compared to digital technology, the number of exposures is more limited in analog photography. On the other hand, analog photographers may have a heightened sense of awareness of what they are shooting and therefore have less need for a greater number of shots. Digital photography, which carries no cost penalty for additional exposures, often leads to an emphasis of quantity over quality. Rather than taking time for a well-planned picture, users seduced by the ease of digital photography often hit the shutter button again and again. In many cases there is no careful consideration of whether a shot should be taken from a particular angle—after all, it costs nothing to just do it. The result can be a large number of shots with little to offer in terms of composition or meaning.

2.1.9 Digital Image Processing

With digital cameras, there are many versatile options available for processing images on the computer as part of the normal workflow, with no loss of quality through the extra step of developing and scanning film. Because photographers are assured of the ability to later correct photographic problems, it becomes much easier to work on location, even in cases when the subject and the angles are difficult. This is especially useful for architectural photography. In this context, we will consider new processing techniques such as panoramic images (section 4.4) and High Dynamic Range Images (HDRI) (section 4.5). These techniques not only allow a different and fresh view of things, but also make it possible to shoot in difficult conditions, such as small spaces or in environments with extreme lighting.

Analog photographers must often engage in a combined method in which film is digitized along the way. Then again, because of the widely improved digital technology, it becomes more and more attractive to follow an all-digital path. For this reason, the majority of photographers now choose this route.

2.1.10 Authenticity and Archiving

Negative and slide film are widely regarded as more resistant to forgery, because the tangible raw material is much harder to manipulate than electronic data. These days, no one would attribute much authenticity to any digital image. There are no actual "originals", but instead there is only data that can be copied and altered in infinite ways.

On the other hand, since there are no single-source originals, digital images are more immune to loss. Digital technology allows unlimited storage, copying, and archiving of pictures—at least theoretically.

2.1.11 Conclusion

As this discussion points out, analog technology still claims many advantages and there are good reasons for its continued existence. But there can be no doubt that the future of photography lies in the digital realm. Hybrid methods, in which analog photography is combined with digital processing, have not become a mainstay. For these reasons, the focus of this book is doing architectural photography the digital way.

2.2 The Camera

For 150 years now, the camera has been the photographer's most important tool. It captures a particular viewing angle of a subject in three-dimensional space and preserves it in a two-dimensional plane. The various camera systems have different suitability for individual photographic tasks. Whether a particular camera is suitable for architectural photography depends on the features and functions that come with it.

What type of camera would be ideal? As we will see, the answer does not depend as much on the camera make as on the film or image sensor format and the overall camera system.

2.2.1 Types of Cameras

The range of camera classes extends from digital compact cameras with tiny sensors to analog 35mm and digital full-frame format cameras, all the way to analog large format systems.

Digital Compact and Bridge Cameras

Digital compact cameras have the smallest image sensor chips. These cameras have a compact size and small weight. As a result, they offer great versatility and high mobility. Even users without much experience can easily work with them. These advantages make them ideal for snapshot photography.

Image sensors and light yield: One major disadvantage of a compact camera is the fingernail-sized image sensor (e.g., 1/2.5 or 1/1.8 inch). Especially with large megapixel counts, such a small image sensor can only achieve low light yield with little available light per pixel. For this reason, the camera must amplify incoming light at a high rate, which leads to a reduced dynamic range and causes visual background noise. Again, this is usually counteracted and "flattened" by the camera's internal functions, but at the expense of photographic resolution. Small image sensors are particularly afflicted at resolutions beyond 6 megapixels, which in turn eliminates most of the gain in resolution one would associate with a higher megapixel figure. In practice, approximately 6 megapixels remain available for the demands of architectural photography, which does not allow much leeway for image processing on the computer.

Integrated lens: The compact camera's integrated lens is designed to maximize compactness, which results in a significant problem with aberrations at the edges of images. "Super-zoom" cameras are especially afflicted by this problem. Another serious disadvantage is the severely limited range of focal lengths,

often with no real wide-angle setting. This alone makes compact cameras largely unsuitable for architectural photography.

Other idiosyncrasies of compact cameras: Small viewfinders and LCD displays that can hardly be seen in extreme daylight make it difficult to assess image composition. Compact cameras often lack manual or half-manual modes that are extremely important in architectural photography. The lack of support for RAW data format (section 4.4.1) is a hindrance for image processing.

There are similar disadvantages with the so-called **bridge cameras**. This type of camera looks similar to an SLR but has a small image sensor size. In addition, the large range of focal lengths usually puts the emphasis on long focal lengths.

Digital SLR Cameras with Four-Thirds, APS-C, and APS-H Standards

Many DSLR cameras use an image sensor format that is much smaller than the regular 35mm format. The reason is primarily the lower cost of smaller image sensors (figure 26).

Among the smallest SLR cameras are those built according to the **Four-Thirds Standard**, which was originally developed by Olympus and Kodak. The image sensor with an aspect ratio of 4:3 is only about half the size of a 35mm format negative, and thus, has a crop factor of 2. (This is often referred to as “format factor“, “focal length multiplier“, or “FLM“.) This factor is only a mental crutch or rule of thumb to put the resulting image in relation to a

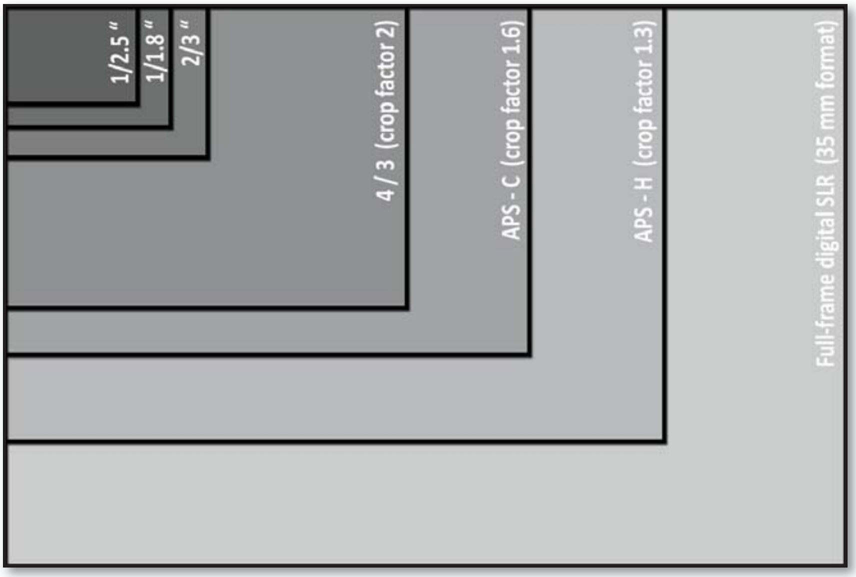


Figure 26: Size comparison of various digital sensors to 35mm format

35mm format shot. For instance, a 14 mm lens on a Four-Thirds camera will produce an image with an angle of view corresponding to a 28 mm lens on a 35mm analog camera. The real focal length of the lens does not change. The change in practical focal length with the digital camera is the product of the length of the lens times the crop factor (in this example: 14 mm x 2).

In contrast to the Four-Thirds Standard, the **APS-C format** of camera makers such as Canon, Nikon, Pentax, and Sony has a bigger image sensor with an aspect ratio of 3:2 and a crop factor of 1.5 or 1.6. A lens used on a camera with this image sensor format will produce the angle of view of a lens with a focal length 1.5 or 1.6 times longer than on a 35mm camera. Because the smaller image sensor size allows a smaller image circle in the first place, lenses custom-built for the APS-C and Four-Thirds formats have smaller diameters than their equivalents for 35mm analog systems (figure 27).

Another image sensor size with a crop factor is the **APS-H format**. This intermediate format is found in only a few cameras and is used primarily for photojournalism and sports photography.

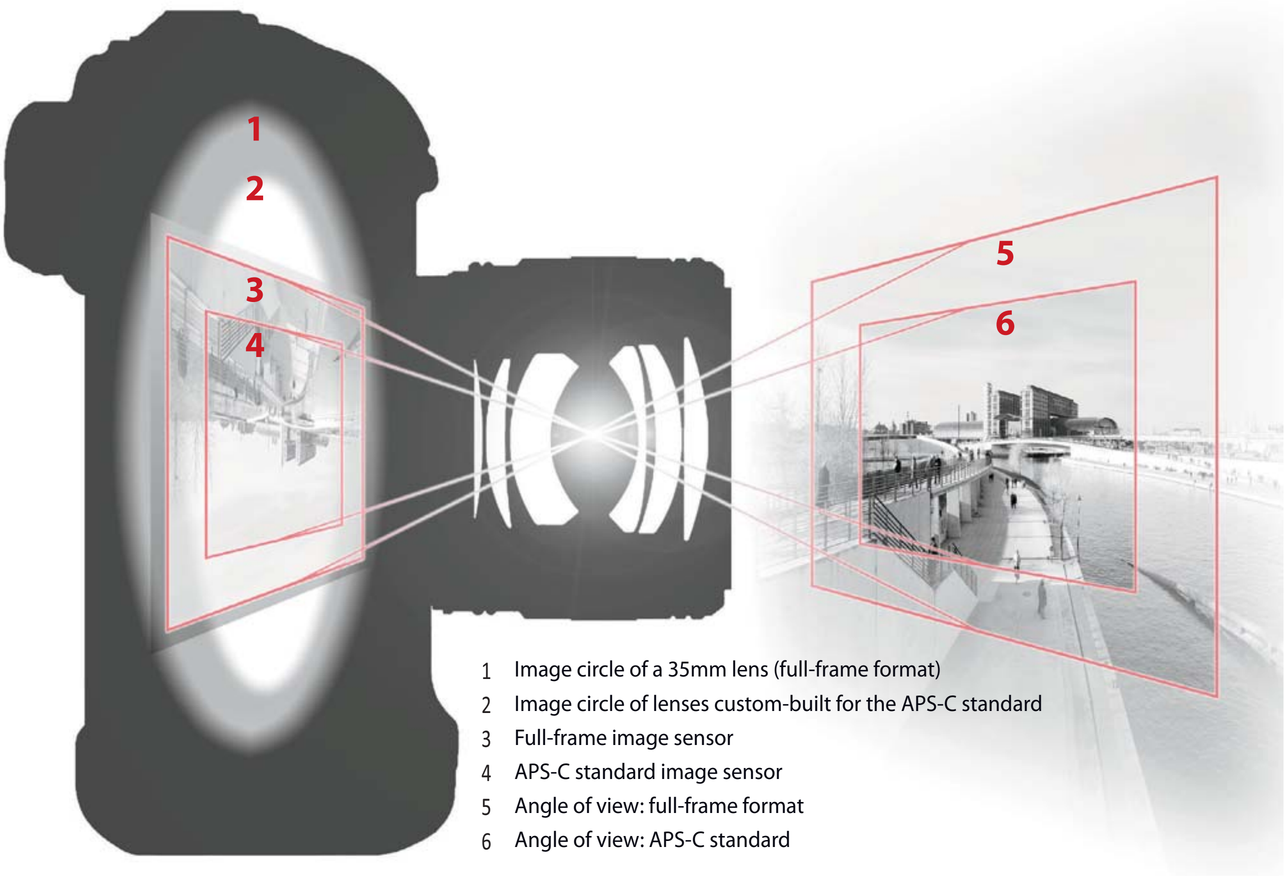


Figure 27

Image sensor size and light yield: In the DSLR class of cameras, sensor pixels are distributed over a much larger surface area. This means that each pixel is bigger and can therefore capture more light. In turn, this increases the dynamic range and the resolution of fine details. Recent image sensors with these formats, double-digit megapixel figures, and high-quality lenses make for excellent image quality—ideal for later corrections on the computer.

Viewfinder image: The sufficiently sized and bright viewfinders of DSLR cameras make the composition of architectural pictures much easier. Contrary to the optical viewfinder of a compact camera, the DSLR's viewfinder image is identical to the image recorded by the image sensor. However, it is important to note that some entry level DSLRs do not have a viewfinder with 100% frame coverage. In these cameras, the viewfinder image will show slightly less than what can be seen on the final picture.

Disadvantages of image sensor size: As a result of the crop factor, sports or animal photographers may welcome the shift of usable focal length towards the telephoto range, but it does not please architectural photographers. One issue is that the few shift lenses available on the market (figure 28) lose their wide-angle effect and part of their usefulness. The same thing happens with all high-quality, wide-angle prime lenses. This is especially annoying for people who already own analog equipment and who want to change to a DSLR without having to invest in an expensive, full-format camera. Even with this in mind, DSLR cameras make it possible to find a suitable lens for every application and purpose, and this alone is a huge advantage in comparison to compact cameras with built-in lenses.

Conclusion: Digital SLR cameras with APS-C, APS-H, and Four-Thirds image sensors, in combination with wide-angle lenses, are quite suitable for architectural photography, except for a few limitations. Those with some ambition in this field but who wish to pursue architectural photography only as a hobby, or who do not wish to invest huge amounts of money, should consider this class of camera.

Figure 28: 24 mm wide angle shift lens

Analog 35mm Format and Digital Full-Frame Format Cameras

Analog 35mm format: Because of their lack of detachable and swappable lenses, analog compact cameras are unsuitable for architectural photography despite their 35mm format. Furthermore, they are hardly sold anymore, which is why we give no further consideration to these cameras.

Analog SLR cameras are a different matter. Not only are they still in use, but they also constitute a practical system for architectural photography and digital processing—as long as one is willing to accept the additional costs of film, film development, and digitizing images. Moreover, analog camera bodies are cheaper than their digital counterparts. The typical image aesthetics of an analog SLR camera can provide nice variety and an interesting experience for someone who otherwise operates only in the digital sphere.

Digital Full-Frame Format Cameras: Several manufacturers in the digital sector now offer digital cameras with a "full-frame" or "FX-format" image sensor that has the same dimensions as a 35mm negative or slide. Examples are certain Canon, Nikon, and Sony models. In the field of architectural photography, eliminating the crop factor is a great advantage. These image sensors preserve the same angle of view we have long known from 35mm analog cameras. This makes it possible to use shift lenses without restrictions. Of course, these cameras only accept lenses designed for this format. Some lenses that do not conform to the 35mm format may extend too far into the camera body, which makes them impossible to use. In other cases, their image circle may not be large enough to cover the entire image sensor (see figure 27, page 22). Although some DSLR cameras allow taking photos with these lenses by adapting the light-sensitive area of the sensor to the size of the image circle, the resulting lower resolution makes them less suited for architectural photography.

Viewfinder image: As a consequence of the larger image sensor in comparison to the APS-C and Four-Thirds systems, digital full-frame cameras are designed with larger prisms and reflex mirrors. This is one reason why the large, bright viewfinders of these cameras rank among the best for SLRs. With the addition of an integrated or electronically produced grid, these viewfinders are ideal for achieving good image composition.

Image sensor size and light yield: At a given number of pixels, the surface area for each pixel on a full-frame or FX format image sensor is much greater than on an APS-C or Four-Thirds standard image sensor. This improves dynamic range, decreases background noise, and lifts the crispness of each pixel. The effect is quite dramatic. For example, even at 20 megapixels the pixels of a full-frame image sensor are still larger than they would be on a 10 megapixel APS-C image sensor (figure 29).

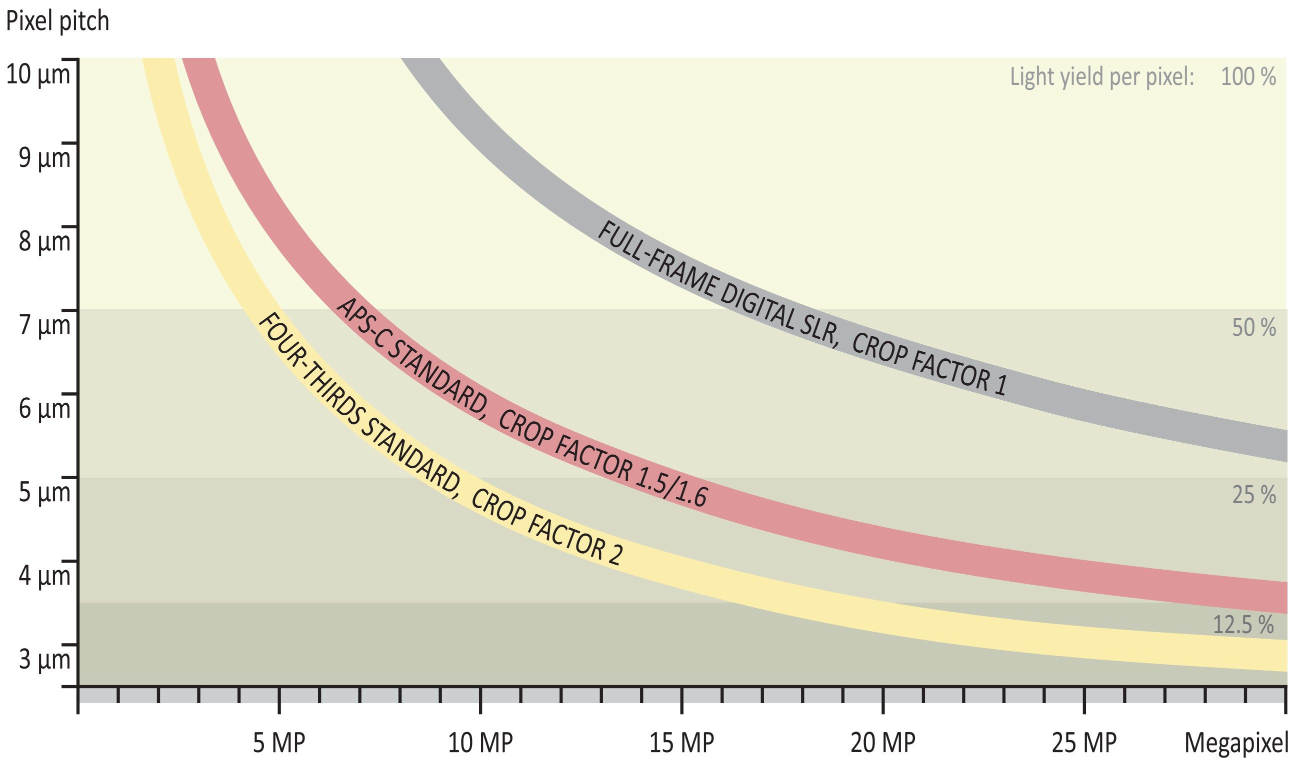


Figure 29: Pixel size comparison and light yield per pixel

Disadvantages of image sensor size: One disadvantage of the larger image sensor is that aberrations at the edges become more visible on account of the lens' fully used image circle. This is especially true with wide-angle lenses and with a fully opened aperture. The results may include vignetting, chromatic aberrations, or blurred areas (see figure 34, page 31). This makes it advisable to always use high-quality lenses that correspond to the quality of the large image sensor. Another downside is that full-frame image sensors are quite expensive to produce. Of course, this raises the price of the entire camera. Taking budgetary constraints into account, it is more prudent to choose a cheaper camera (for example, an APS-C) and equip it with a first-class lens, rather than obtaining an expensive full-frame camera and putting a mediocre lens on it.

Conclusion: As long as the camera and lenses are carefully matched in terms of quality, an analog 35mm or digital full-frame camera is perfectly suited for architectural photography.

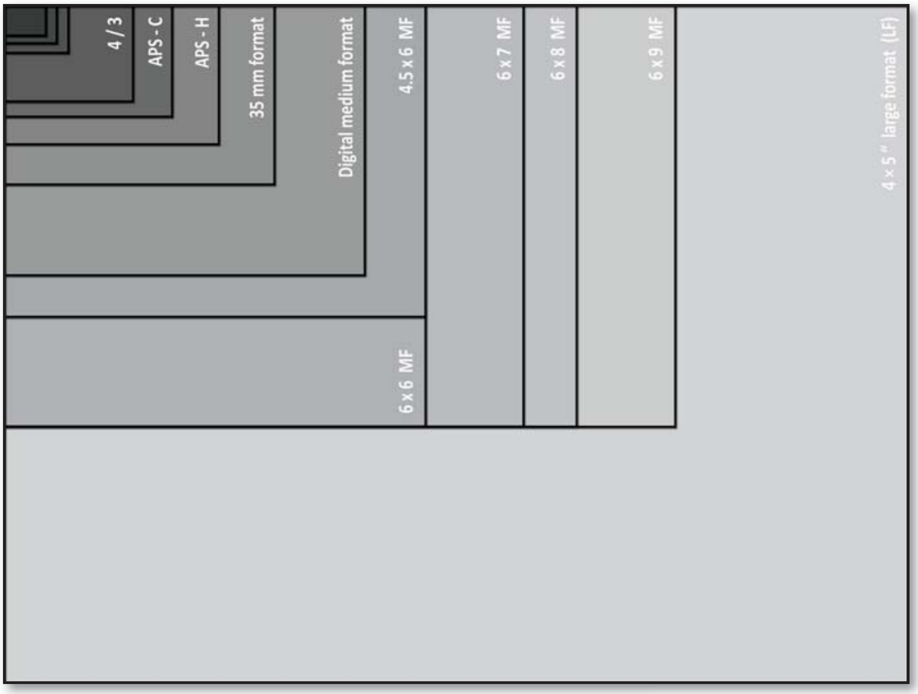


Figure 30: Comparison between image sensors and film frame sizes ranging from digital SLRs to analog large format cameras, in real size

Analog and Digital Medium Format

Medium format has always been a cornerstone of professional portrait and fashion photography, but is much less so for architectural photography—mainly because perspective corrections can be more easily accomplished with large format cameras.

Analog medium format works with film rolls that have a much larger surface area than 35mm format films (figure 30). Because of this difference, a 28 mm medium format lens will image an angle of view equivalent to the super-wide lens of a 35mm format camera. Also, as a result of the larger surface, the image quality and potential resolution are much better than that of an analog 35mm camera. On the flip side, there are higher costs for film, developing, and digitizing. Medium format cameras usually consist of a lens, a mirror box with either a waist-level or an eye-level viewfinder, and a detachable film cassette (figure 31). Most medium format cameras are purely manual, but there are also some autofocus models. These cameras are larger and slower and lack the versatility of 35mm cameras, which is why they are rarely seen being used in action, sports, or animal photography.

Figure 31: Analog medium format camera

High-quality **digital camera backs** have been available for some time now. They can be attached to the camera in place of the usual film cassette, and they deliver excellent image quality. The image sensor of a digital back

has about twice the surface area of a digital full-frame camera. In order to convert the focal length of a lens used with a medium format digital camera back to 35mm format equivalent, we must divide by 1.4; in other words, a full-frame image sensor's diagonal is smaller by a factor of 1.4 when compared with the image sensor of a medium format digital camera back. Even so, the surface area of a medium format digital image sensor is still much smaller than that of analog 6 x 6 medium format film. Therefore, the image sensor will not show the entire available image circle of a medium format lens. Even in combination with the shortest available medium format lenses, the resulting image will have less of a wide-angle lens effect in comparison to analog 35mm format or full-frame digital SLR cameras. This issue, in combination with a lack of available wide-angle shift lenses, means that medium format cameras have limited usefulness for architectural photography.

Analog Large Format

For professional architectural photography the analog large format camera reigns supreme; there simply is no comparable digital technology. Large format is also one of the most historic forms of photography. Aside from architectural photography, analog large format cameras are also used for advertising and product photography. The cameras are usually mounted on an optical bench and allow for flexible perspective corrections on location (figure 32). These cameras are fully manual, which makes the entire work flow much slower than digital systems. There is no autofocus or automatic exposure control; in fact, little has changed in over 100 years. In general, this makes large format cameras quite cumbersome and less flexible than medium or 35mm format cameras. But since architectural subjects are immobile, this disadvantage does not play a major role in architectural photography. Large format film is ideal in that it allows extremely high resolution as well as very wide angles. Then again, the cost of film, processing, and digitizing can easily reach $75 per image or more.

Figure 32: Analog large format camera

Digital image sensors deserving of the term "large format" are practically nonexistent. The costs are prohibitive when the difficulty of manufacturing and the relatively small market are taken into account. What come closest are digital medium format backs that can be attached to large format cameras. But in this case, extreme wide-angle lenses are required to compensate for the relatively small image sensor surface. (The same is true with medium format cameras.) Meanwhile, it is possible to find large format lenses adapted for digital image sensors. With a focal length of 35mm (equivalent to 25 mm when used with a 35mm format camera) these lenses make perspective correction possible. Among them, there are some lenses with focal lengths as short as 24 mm; but due to their narrow image circle, these lenses make perspective correction impossible.

In order to complete the list of large format equipment, “scan backs“ should be mentioned as well. When inserted into a large format camera, these devices scan an image line by line in the same manner as a conventional flatbed scanner. The problem with this technology is that during the long scanning process, objects in the picture must be absolutely still and the light must not change. Therefore, scan backs are mainly suitable for scientific photography or for the reproduction of art.

Bottom line: Digital architectural photography with large format cameras has certain limitations. One serious problem is their high cost of tens of thousands of dollars, which can be steep even for professional photographers. After all, every camera must at some point recover its cost. Many professional architectural photographers consequently use the versatile and fast digital full-frame camera, at least for part of their work. It is uncertain how digital technology may affect large format photography in the future. Either the image sensors must become larger or the lenses must yield wider angles before digital technology can provide serious competition for analog large format photography.

2.2.2 The Camera: Conclusion

The deliberations above point out that there is no perfect solution when it comes to the choice of a camera for architectural photography. Each system has its strengths and weaknesses. The hope of professional architectural photographers is a digital solution that allows for both image quality and perspective correction that is on par with an analog large format camera. Until such a system appears on the market, some professional architectural photographers will continue to work with analog large format cameras, and will then digitize the exposed film at considerable expense. Other photographers use digital full-frame cameras with shift lenses, or they correct perspective projection distortion with the aid of subsequent image processing.

All in all, digital full-frame systems seem to be the most versatile solution at the moment, because they meet all the requirements of architectural photography: good image sensors, wide dynamic range, manual setting options, large and bright viewfinders, and low operating costs.

For hobbyists and advanced amateurs with limited budgets, the best bet would be a DSLR with an APS-C image sensor. These cameras are significantly cheaper than their full-format cousins. Moreover, there are still fans of analog SLR cameras. However, few will be able to avoid the need to digitize the resulting images.

One thing can be said with certainty: neither analog nor digital compact cameras are suitable for architectural photography. Since they do not offer the necessary wide-angle options and image quality, they are simply not useful for the particular requirements of this field.

2.3 The Lens

The choice of lens determines the angle of view, the sharpness of the subject, and the number of optical aberrations that the sensor captures. Therefore, the optical quality of the lens is a decisive factor when it comes to image quality. Visual information that does not reach the sensor due to a lack of lens quality obviously cannot be processed. Therefore, the combination of a more affordable camera with a high-quality lens is always better than the opposite. Although most digital and analog single-lens reflex cameras on the market are suitable for architectural photography, the same cannot be said for lenses, where a more careful selection is needed.

This brings up the question of the particular characteristics of lenses ideal for architectural applications. Long focal lengths, fast autofocus, and great light sensitivity are musts in sports photography. Portrait photographers do best with medium focal lengths and good visual quality, even in the largest aperture settings. But for architectural photographers, there are two main considerations: focal range and optical imaging quality.

2.3.1 Focal Range

Architectural photography requires a selection of wide-angle lenses ranging from an ultra-wide-angle to a moderate telephoto lens. Wide-angle lenses image a larger area than normal or telephoto lenses. This also means that because of the wider viewing angle, objects appear smaller on the image sensor or film. Lenses which produce an extremely wide angle of view are called super- or ultra-wide-angle lenses. Normally, these include lenses with focal lengths up to 24 mm which cover a diagonal angle of view of 84 degrees and more when used with a full-frame 35mm format camera (figure 33).

If all buildings would sit in the middle of a landscape, undisturbed by intrusive objects around them, architectural photographers would need only one moderate wide-angle lens. In that perfect world, a photographer could easily walk around a building and choose the ideal vantage point. But in reality, locations are almost never ideal, and the photographer's choice of positions is usually limited. The majority of buildings are found in tight urban settings where the photographer's freedom of movement is restricted to surrounding streets and parking lots. Even worse, optically ideal positions are often obstructed, blocked, or simply not accessible. Objects such as signs, lamps, or vehicles disturb image composition

Figure 33: 14 mm full-frame format super-wide angle

and aesthetics. In such situations, the photographer needs to adjust the focal length to the situation at hand. In most cases, this means closer proximity to the building and a shorter focal length.

While small interior spaces often require extreme wide-angle lenses, moderate telephoto lenses are well suited for emphasizing details on a building or even showing a building from a greater distance. Ideally, any set of lenses should also include shift lenses that allow for immediate perspective corrections on location (section 3.4.2).

2.3.2 Optical Quality

Architectural photography calls for lenses with sufficient quality to allow a clean and crisp rendering of the subject with little aberration over the entire image area (figure 34).

Because of the large dimensions of buildings, the distance between the subject and photographer needs to be relatively long. In most cases, wide-angle lenses must be used. As a result, selective use of depth of field does not play an important role. On the contrary, documentary architectural photography generally strives to show the entire expanse of a building in focus. Apertures will usually be kept small, which has other advantages; for example, optical errors such as vignetting, chromatic aberrations, and blurring around the edges are less of a problem. Unfortunately, it is difficult to entirely avoid chromatic problems and blurring. Chromatic aberrations may be corrected with image processing software, but edges will often remain less focused than the image center. This problem is especially prevalent with very wide lenses in cheaper price ranges. Distortions, on the other hand, are not dependent on the aperture setting. Pincushion- or barrel-shaped distortions are especially noticeable at the long and short ends of a zoom lens' focal length. Therefore, it is best to leave enough space around the subject so that distortions can be corrected afterwards via digital image processing.

Many photographers take it as given that lenses with a fixed focal length (also known as "prime lenses", "primary lenses", or "FFL" lenses) deliver better image quality. After all, they have a simpler optical structure which allows for a more precise design. This may be so, but even though better image quality is more likely with fixed focal lenses, it is not guaranteed. For example, fixed lenses designed for analog SLR cameras may sometimes be outdone by modern zoom lenses that are customized for digital cameras.

Another point to consider is the reduced flexibility of fixed focal lenses. Then again, a deliberate choice of shooting positions and a few additional steps can circumvent this difficulty. In short, as long as the optical properties are right, it makes no significant difference whether fixed lenses or zoom lenses are employed for architectural applications. In most cases, price is the decisive factor. An expensive lens is almost always better able to avoid aberrations than a simpler and cheaper "beginner lens".

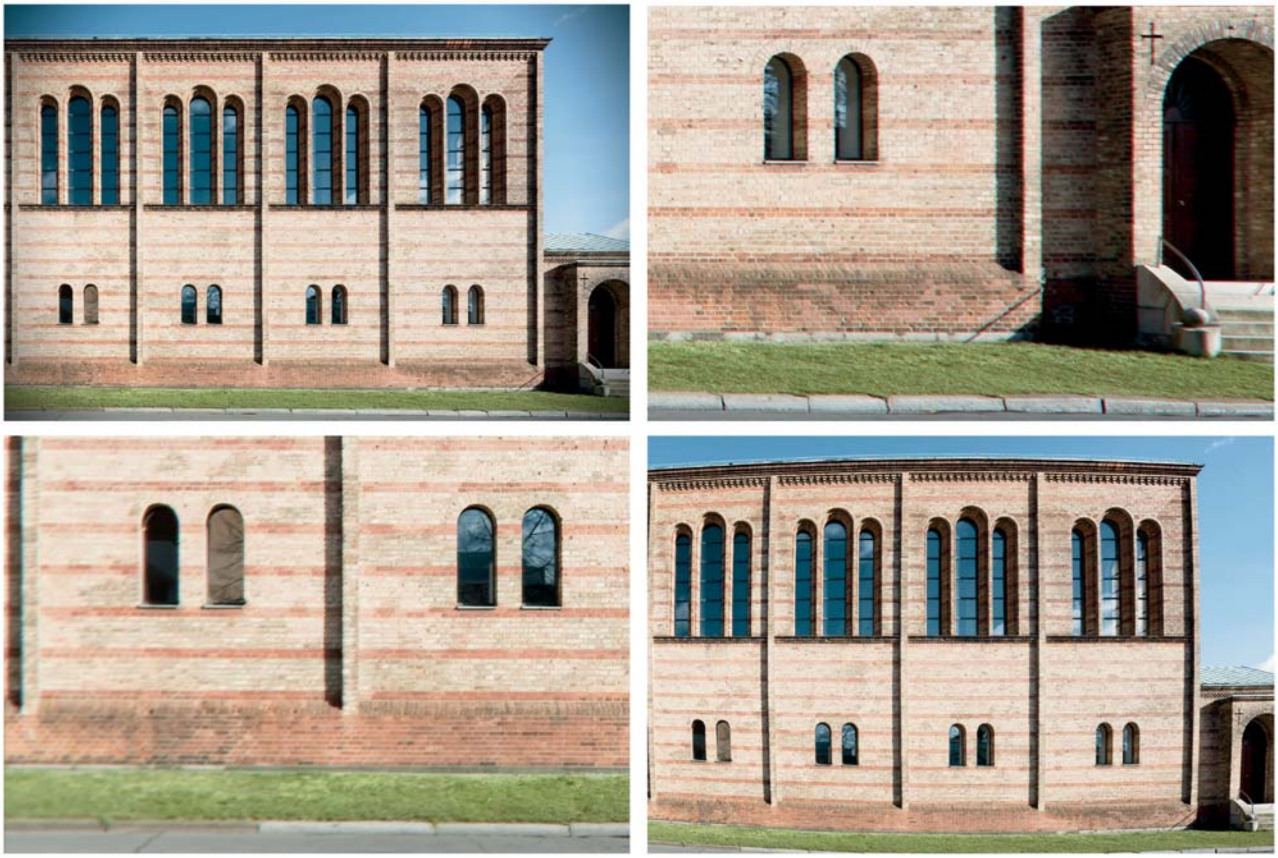


Figure 34: Optical aberrations of lenses (from upper left, clockwise: vignetting, chromatic aberration, barrel distortion, blurred edges)

2.4 The Ideal Camera and Lens Combination (for all wallets)

Novices who are not looking for a compact camera will benefit from a basic DSLR system. For less than $1,000, all the major manufacturers offer kits that include the camera and a zoom lens. This is certainly enough to gain experience with taking pictures of architecture, and the SLR construction makes it possible to upgrade to better lenses later on.

For those who want to work more intensively with architectural photography, a super-wide angle zoom lens should be the first piece of additional equipment. These lenses are offered by all major lens manufacturers and cost around $500. They make it possible to shoot in a wider variety of conditions, for example, interiors and enclosed spaces.

For more ambitious photographers, a medium-sized DSLR camera would be a good investment. The equipment should include a super-wide lens and a high-quality standard zoom lens extending into the lower telephoto range.

In addition, a few lenses with fixed focal lengths will enhance the toolkit. This will easily push the cost of equipment to more than $2,000.

Semi-professional photographers should seriously consider a full-frame camera and matching high-quality zoom and fixed focal lenses. A shift lens would also be a good acquisition because it works ideally with a full-frame sensor. This level of equipment would cost several thousand dollars.

Professional photographers with unlimited budgets should choose large format cameras with digital medium format backs for the optimal resolution or the top of the line, digital full-frame camera models, and matching wide-angle lenses for the best optical quality. Shift lenses are always part of the toolkit. Any additional lenses that are incompatible with the camera's lens mount may be connected via matching adapters. Of course, no one should be surprised that the cost for all of this hardware can easily exceed five figures.

2.5 Accessories

Even if someone is "only" an ambitious hobbyist, there are many essential pieces of equipment. Some accessories make the work of architectural photographers easier and some are prerequisites in certain situations. The following is a discussion of useful equipment that should be considered for purchase.

2.5.1 Tripod

A tripod is a fundamental tool in architectural photography. A tripod can enable focused pictures that are free from blur caused by camera shake in low light conditions (for example, in interior spaces, during twilight, or at night). Even daylight conditions combined with small apertures and/or neutral density filters can easily result in exposure times that are too long for even the most stable hands.

Of course, shots can be made without a tripod; if the light is bright enough, any shot can be taken when hand-holding the camera. But the use of a tripod has other advantages in addition to avoiding camera shake. First, it makes it easier to precisely choose the frame. Second, image composition is easier because the image in the viewfinder is absolutely stable. This gives the photographer more time to think about the picture's composition. Third, waiting for the perfect moment to release the shutter becomes easier as well. If the camera is on a stable mount, the photographer can simply wait until all distracting objects (such as cars, people, or clouds) have moved out of the frame or into a desirable position before taking the shot.

The tripod should not be too light or fragile, and it should not be weighed down to its maximum load-bearing capacity. Unlike other areas of photography, architectural photography does not demand a high degree of mobility,

so it is not necessary to worry about every additional ounce of weight. Moreover, sudden wind gusts are capable of shaking the camera and ruining the shot. In short, the more stable a tripod is, the better it is for architectural photography.

2.5.2 Tripod Head

Figure 35: Regular pan-tilt head with quick-release mounting plate

In addition to the tripod, the head or mount also plays an important role. In many cases, the mount is sold separately and can be tailored to individual needs. The most useful designs are the pan-tilt head (figure 35) and the ball head (figure 36). Ball heads can be adjusted quickly with a single hand motion. Pan-tilt heads do not have the same agility and ease of use, but their separated planes of adjustment are more precise and allow the most miniscule adjustments. Both designs are a matter of individual preference.

Figure 36: Complex ball head bearing with quick-release mounting plate

As with the tripod, inferior quality can quickly lead to frustration—particularly if the mechanism cannot be precisely adjusted and always seems off by a few millimeters. This means that getting the frame in the viewfinder exactly aligned becomes some kind of gamble. Therefore, cheap tripod and head combinations should be avoided. This is the wrong place to save money, because the buyer will soon realize that flimsy tripods are too unstable, and poorly made heads are overburdened by relatively heavy DSLRs. In such cases, the unavoidable outcome is the follow-up purchase of another tripod and head, this time of better quality. An investment of at least $100 for a tripod and $50 for a head will usually lead to enjoyment of the equipment for a long time. If $150 for a tripod and head seems high, consider how many hundreds or thousands of dollars the most enthusiastic photographers have invested in their equipment. The costs of a long-term investment like a sturdy tripod and head suddenly seem quite reasonable.

Quick-change adapter mounting plates are highly recommended but aren't absolutely necessary. They make it possible to quickly mount and dismount the camera without having to screw the bolt. In many cases, the head already comes with such mechanisms. For photographers who shoot lots of vertical pictures, a special level tool, a so-called L-bracket or L-plate will help (figure 37). While not a cheap piece of equipment, an L-bracket makes it easier to shoot vertical pictures from a tripod, improves stability and reduces the need to recompose. Panoramic photography enthusiasts may also want to buy a special panoramic head in addition to a regular one.

Figure 37: L-bracket for either horizontal or vertical shots

2.5.3 Remote Shutter Release

This is a small and extremely useful accessory. In combination with a sturdy tripod and an activated mirror lock-up function, it assures images free of blur caused by camera vibrations. For digital cameras, there are systems based on

wires as well as wireless devices using infrared light or radio transmissions. Some older analog cameras employ mechanical Bowden cables.

Original Equipment Manufacturer (OEM) remote controls are often more expensive than aftermarket products available from secondary vendors and on the Internet. A wired remote release is a simple device that can even be homemade by a skilled tinkerer.

In order to achieve precisely stacking High Dynamic Range (HDR) or Dynamic Range Increase (DRI) images (section 3.9.5) the use of a remote control is a must, as even engaging the regular shutter button can move the camera by a few pixels. The advantage of a remote control in comparison to a built-in, time-delayed shutter is that it makes it possible to choose just the right moment to release the shutter. However, some remote controls engage the autofocus before the actual shutter release, which can shift the focus undesirably. This can be avoided by deactivating the autofocus before the shot.

Figure 38: Petal or tulip lens hood

2.5.4 Lens Hood

The lens hood or lens shade is an important accessory that is often included with a lens (figure 38). It is designed to shield light coming from the side from hitting the lens without causing shade in the corners of the final picture. Unless there is a filter attached to the lens, it is useful to leave the lens hood in place all the times, even at night when, for example, passing cars often throw light sideways against the lens and cause undesirable lens flares and reflections in the final photo (figure 39).

Figure 39: A lens hood may have helped to minimize this lens flare

A helpful side effect of lens hoods is the protection they provide from scratches, bumps, and inclement weather. It is important to ascertain that the hood is seated correctly, since a small misalignment can lead to annoyingly darkened edges.

2.5.5 Lens Filters

The use of filters in front of the lens has diminished with the rise of digital technology. In many cases, it is possible and easier to create the effects with digital processing. But the effects of some filters cannot be created by software, and those filters continue to be used in architectural photography (section 3.10). Some of the most commonly used filters are described here.

Figure 40: Circular polarizing filter

Polarizer: A polarizing filter is highly recommended. It only lets light pass through if it matches the polarization plane of the filter (figure 40). With this filter, it becomes possible to eliminate reflections from smooth, non-metallic surfaces such as windows or water. Also, the blue of the sky at a 90-degree angle to the sun can be emphasized or darkened, producing more contrast with white clouds. On SLR cameras, circular polarizing filters should be used, because they allow the correct evaluation of distance and exposure. Rotating the front filter ring can modify the intensity of the polarizing effect.

Figure 41: Graduated neutral density filter with holder

Graduated neutral density filter: While polarizing filters usually come as round filters with threading, the ideal shape of a graduated neutral density filter is square or rectangular. They are inserted into a holder that is then screwed into the lens. Positioning the height of the filter allows the photographer to selectively darken light areas in an image (figure 41). For instance, a high-contrast situation consisting of a dark foreground and a bright sky can be dealt with by darkening the sky, which then produces a more even exposure throughout the frame. The most useful filters for practical applications are those that do not darken in a linear way from the lower edge, but rather begin to darken in the middle and have a progressively darker tint toward the upper edge.

Figure 42: Neutral density filter mounted on lens

Neutral density filter: A neutral density (ND) filter creates a reduction in light that is equal throughout the entire frame (figure 42). This results in lower shutter speeds. ND filters are available in a range of tints. Some reduce the light by just one f-stop, and others ten times as much, or more. One application for an ND filter is showing the movement of cars or people via motion blur even in bright light. This effect is frequently used in architectural photography.

As with all filters, but especially the polarizer, the overall image quality will suffer the least with the highest quality filter.

2.5.6 Lens Adapters

Figure 43: Mount adapter for the use of other systems' lenses

Many owners of SLR cameras assume that they must use either OEM lenses or compatible aftermarket lenses by makers such as Sigma, Tamron, and Tokina. However, this assumption is not always correct. Adapters make it possible to use older lenses that are not compatible with the lens mount, such as the M42, Olympus-OM, Pentax-K, Contax/Yashica, Leica-R, or medium format lenses (figure 43). This capability can be a tremendous advantage for someone who owns old Leica equipment, for instance. Attached to a modern SLR, Leica's excellent lenses will trump the optical qualities of many new, high-quality lenses.

Of course, using an older lens means that the focus must be manually set. Exact focusing may be a problem, especially with telephoto lenses, because their depth of field with an open aperture is much smaller than that of wide lenses. One solution is an expensive adapter with an "autofocus confirmation chip" that lights up the corresponding fields in the viewfinder when the focus is correct. An alternative solution is to use the magnifying function on cameras with live-view ability. This function greatly improves focusing when the subject is a stationary object.

Another limitation of using adapters with older lenses is that aperture settings cannot be transmitted electronically from the the camera to the lens. Therefore, a lens with an aperture ring is required for setting the aperture. The way around this is to focus this lens with an open aperture, then to stop down to the working aperture, and adjust the exposure afterwards by using the camera's internal light meter before triggering the shutter. For the next exposure, the aperture must be opened again. The entire procedure takes time, but this might not constitute a serious problem for stationary architectural photography.

Unfortunately, the adoption of aftermarket lenses does not work in all combinations. Special attention has to be paid to the flange registers of the camera and the aftermarket lens systems. The flange register (often referred to as "flange-to-film distance" or "flange focal distance") is the distance between the sensor or film and the flange part of the lens mount. For instance, if the camera's flange register is too long for the lens system, it is impossible to focus into infinity. This is why there are few adapters for such lens-camera combinations. Cameras with long flange registers (for example, cameras with the Nikon F-mount) and lenses for camera systems with short flange registers (for example, the older Canon FD series) have particular limitations in terms of adaptability. If such a combination is to be used anyway, it may be necessary to do without the infinity setting. The only other option would be to use special adapters with additional lens systems, but these also cause a worsening of optical qualities.

By the way, the Canon EOS system has the biggest range of compatibility with aftermarket lenses, not only because its lens mount has a large diameter, but also because the lens mount itself has the shortest flange focal distance of all common SLR cameras. For these two reasons, almost all lenses from other manufacturers can be adapted to the Canon EOS system.

Figure 44: Viewfinder with special grid screen

2.5.7 Grid Screen

Gridlines projected into the viewfinder make it easier to gauge the camera's precise aiming axis, which is especially important in architectural photography. If a camera does not have this function built in, it is worth the effort to upgrade it with a grid-type precision matte focusing screen.

The lines can then be used to align the camera precisely with the vertical and horizontal lines of buildings. Because this ensures that the camera is aimed correctly during the exposure, much time can be saved when it comes to digital processing (figure 44). In addition, the proportionately placed lines also help compose a balanced frame (section 3.8).

2.5.8 Memory Cards

It is always highly advisable to have enough storage media or film on hand. The number of exposures needed can rarely be estimated beforehand, since it is impossible to predict with certainty what the field conditions will be and how

quickly they may change. There are days when it seems the pictures almost want to jump into camera on their own, while on other days all the pictures seem to be hiding.

With analog film, the possible number of exposures is clearly defined. With digital cameras, it should be noted that uncompressed RAW files often need much more storage space than one would assume (section 4.1.1). Since image sizes of 15 megabytes or more can quickly consume the available memory space, extra memory cards are well worth the cost.

One advisable technique is to store smaller JPEGs in addition to the RAW images. This makes sorting pictures on the computer much easier, but requires additional storage space. Photographers going after panoramic shots (section 3.7.1) or HDR and DRI images (section 3.9.5) must take into account that these types of photography require several shots per image and by extension more storage space.

2.5.9 Batteries and Rechargeables

What goes for SLR storage media is also true for batteries. There should always be available spares, particularly if the photo shoot takes place over a long period without recharging options. It should be understood that in colder temperatures, batteries will not perform as well and the number of possible exposures will decrease. Subsystems that are particularly power-hungry are bright displays and image stabilizers (regardless of whether they are part of the camera or the lens).

If the power reserves are low, it is best to power down the camera after each shot and deactivate the post-shot image playback. If it is necessary to do prolonged shooting without external power, the purchase of an external battery grip should be considered. Such a device can hold several rechargeable batteries and often even regular AA batteries, which are commonly available all over the world. As a bonus, the external power grip also improves the camera's vertical handling characteristics.

2.5.10 Flash

Flash units do not play a major role in outdoor architectural photography. A plain flash attached to the camera is virtually useless, and even high-powered flash systems are usually too weak when it comes to lighting the entire exterior of a building. However, in interior spaces, flash systems can accentuate and brighten targeted areas. For this purpose, powerful detached flash systems are needed in combination with suitable reflectors, striplights, and soft boxes. In many cases, interior shots often appear more natural without artificial flash light because the ambiance of interior spaces is usually carefully orchestrated by architects and lighting designers.

2.5.11 Additional Accessories

Other accessories worth considering include protective sleeves to keep the camera dry in bad weather, and tools such as brushes and blowers for cleaning the lenses and sensor. Such items are usually inexpensive and can be useful in many situations. A right-angle viewfinder attachment can help when shooting from just above the floor, though many SLR cameras have a live-view function that does the job when the camera is placed in inaccessible positions.

2.6 Creativity Tips

The following section describes some gadgets that can infuse more visual creativity into architectural shots.

2.6.1 Lensbabies

"Lensbabies" allow for a playful use of photography. Their flexible tube section allows photographers to play with the focus (figure 45). Similar to lenses with tilt mechanisms, Lensbabies produce creative focal plane shifts by angling, expanding, or collapsing the lens. This causes only a small section of the frame to be in focus—the "sweet spot"—while other parts of the frame are blurred. Of course, there should be no high expectations when it comes to optical clarity and quality. The basic idea is to integrate the resulting distortions in a creative way.

Theoretically, this design would even make it possible to achieve perspective corrections or distortions, but in the real world this is only possible in the smallest way because the tube is not flexible enough.

Figure 45: Third generation Lensbaby

2.6.2 Black & White Negative Film

Black and white film presents another option for showing architecture in creative ways (figure 46). The photographer must know how to work with the qualities of black and white film. When compared to color film, it offers more opportunities for interpretive freedom. Two strongly contrasting colors may be rendered in exactly the same shade of gray when shot in black and white. This loss of information may give a picture a more surreal or abstract quality. Surfaces and structures of a building become invitations to experiment.

There are good reasons why black and white images remain popular. Many viewers find them more engaging, and there is a certain aura of uniqueness attached to black and white pictures. This impression can become stronger with higher film speed and the resulting grainy structure. Especially interesting

Figure 46: ISO 400 Black & White film

outcomes can be achieved by the deliberate use of grain (see figure 152, page 109). Nicely done black and white architectural shots will always capture the viewer's attention, whether the subject is old and ornate or is sleek and modern.

2.6.3 Use of Fixed Focal Lenses

Figure 47: fixed focal lens

Compared to zoom lenses, fixed focal lenses (FFLs) seem much less versatile, especially considering that their main advantage is their wider maximum aperture—a quality not often needed in architectural photography. Nevertheless, it can be very rewarding to use only one or two fixed lenses (figure 47) for an entire day. The set focal length encourages the photographer to become intensely familiar with the surrounding spaces. More time will be spent choosing positions and searching for better alternatives. This not only trains the eye for the subject, but also enhances its perception and brings out new insights about individual positioning choices. At the end of such a day, many photographers will realize that even though their choices were somewhat restricted, those limitations were not as crucial as originally assumed.

3 Shooting Techniques

This chapter discusses the question of how architecture should be photographed. It includes all aspects to be taken into account for a shot. A wide range of factors determines the way a building appears in a picture. Some of them concern the way a photographer acts on location, and keeping an eye on these points leads to decidedly better pictures. Others factors, such as the light or the weather, cannot be freely chosen or are beyond the photographer's control.

This chapter also points out that different approaches can produce entirely different results. One method may present a building directly and authentically, while another might depart from the building's original expression to create a new and autonomous visual impression.

3.1 Hallmarks of a Good Architectural Picture

A good architectural picture rests on a well-composed frame and direct, compelling visual language. If a picture's central theme is architecture, other components must not be allowed to play a dominant role. If, on the other hand, the picture illustrates the relationship between two buildings, then their connection must be clearly represented. A violation of "the rules" can certainly be done on purpose for creative effect, but in that case the deliberateness must be obvious. Otherwise, the viewer will be inclined to interpret it as incompetence.

Well-executed documentary architectural photography compels the viewer with clear, tidy visual language and produces a feeling of familiarity with the building, even if the viewer is unfamiliar with it. In addition, this type of shot serves to enhance the building's design qualities (figure 48).

Figure 48: Documentary architectural photography: clear, organized visual language

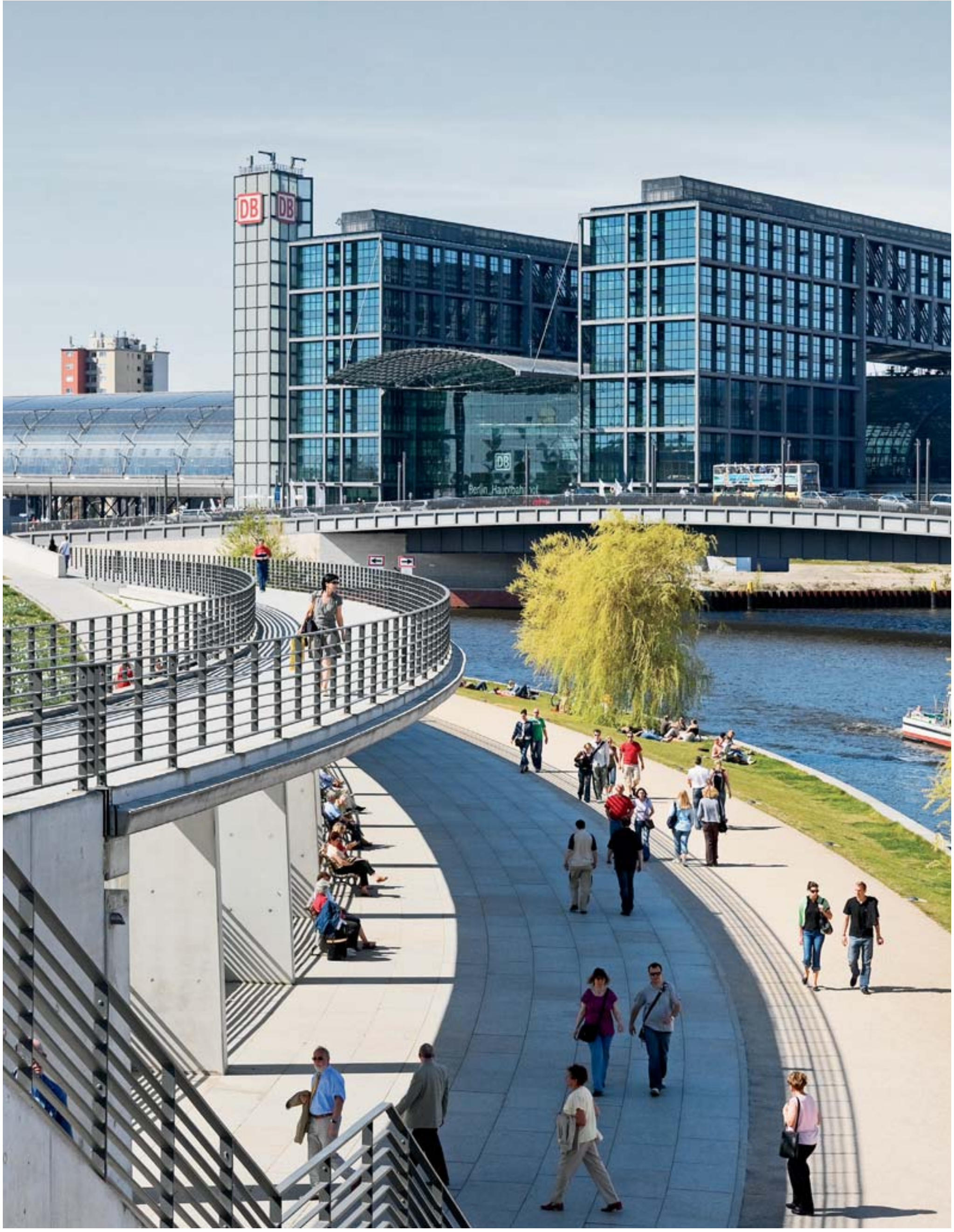


Figure 49: Modern architectural photography: integration of the environment

At the same time, modern documentation of architectural features also allows for the viewer's personal interpretation of a building, within certain limits. A skilled photographer can go beyond the purely exacting and sterile representation of a building and give the entire setting a more authentic and natural look by using aesthetic means (figure 49).

In contrast, a more artistically inclined approach to architectural photography must be evaluated by its visual message. The quality of the architecture in such pictures is usually unimportant. Rather, the picture propounds its own effect independent of the subject. Successful creative architectural

photography captivates the viewer by telling a story, by pointing out contradictions, or by causing the viewer to notice architectural traits that otherwise would be veiled in subconscious perception (figure 50).

In any case, the way an architectural picture is perceived depends to a certain extent on the viewer. For instance, an architect may appreciate the clear lines of a façade without drastic shadows or extreme angles, while a photographer may be attracted by the play of light and shadow. A viewer inexperienced in both fields may be impressed by an extraordinary effect on an ordinary façade, or may find pleasure in recognizing a familiar building.

Figure 50: Artistic architectural photography: visual message is separate from the actual architecture

Divergent Views of Architects and Photographers

In the field of architectural photography, the two worlds of architects and photographers crash into each other. Although both are artistically minded forms of expression, the approaches taken by architects and photographers are quite different.

The architect works with three-dimensional structures and with spaces; the photographer works with two-dimensional surfaces. The architect measures his draft, his concept, by constructive points of view. He looks at architecture as a constant, which is bound to exist over a long period of time. The photographer records the transitory play of light and darkness, and of dimensionality; he records a subjective perception of a particular moment in time.

Architects ask for architectural photographs that are rich in information and with a minimum of perceptional changes to the building; images that depict the building's intended impression; images that make the building dimensionally understandable and readily experienced by the viewer. Conversely, a photographer's individual, artistic interpretation expressed through extreme viewing angles or framing reduces the information density of the photographic representation.

Due to the fact that every architectural depiction is always interpretive, and because any interpretation or orchestration has the potential to diminish the architect's vision, the architectural photographer's task is a difficult one, for he must unite both viewpoints into one.

Figure 51: Building as a dominant, central subject

Figure 52: Several buildings combined: varying degrees of importance within composition

Figure 53: Building in suspenseful relation to an external object

3.2 Architecture as a Subject

The central subject of an architectural photograph is obviously a building. Its immobility and sheer size distinguishes architectural photography from all other photographic work. Architecture is the dominant element in the visual composition, and all other objects in the frame are subordinate to it (figure 51). If several buildings are shown in combination, the picture usually shows a scale of importance. The image is dominated by the building in its center, or by the building covering the largest part of the frame (figure 52). It is also possible to show several buildings in balance, but in all cases architecture is the central theme.

One of the traits of more artistic architectural photography is the inclusion of a building's environment as part of the image composition, which causes a weight shift. Such images show architecture in a fascinating relationship with objects such as trees, signs, or people. The building is no longer the unchallenged center of attention, but it appears in combination with other similarly important subjects (figure 53).

Even images where architecture plays a secondary role can be classified as architectural photography. The building may serve as background for another subject or be entirely unrecognizable. Architecture, while part of the picture,

Figure 54: Abstract depiction of architecture

Figure 55: Weathered building façade

can be skillfully altered and selectively framed so that the image becomes a play of shapes and lines (figure 54).

Before each shot, the photographer must think carefully about how to represent a building. It can be the central subject, part of a combination of subjects, or assume lesser importance in the overall composition.

3.2.1 What Kind of Architecture Makes the Best Subject?

In general, each and every building, regardless of how old, decayed, unattractive, or ornate, can be a rewarding subject. A fascinating subject is not automatically defined by the characteristics of the building (figure 55). The way in which the building is used visually in the picture is much more important. Circumstances vary greatly depending on the type of building. On the one hand, central staging may be the best solution for noteworthy new buildings (figure 56). On the other hand, older buildings, especially in

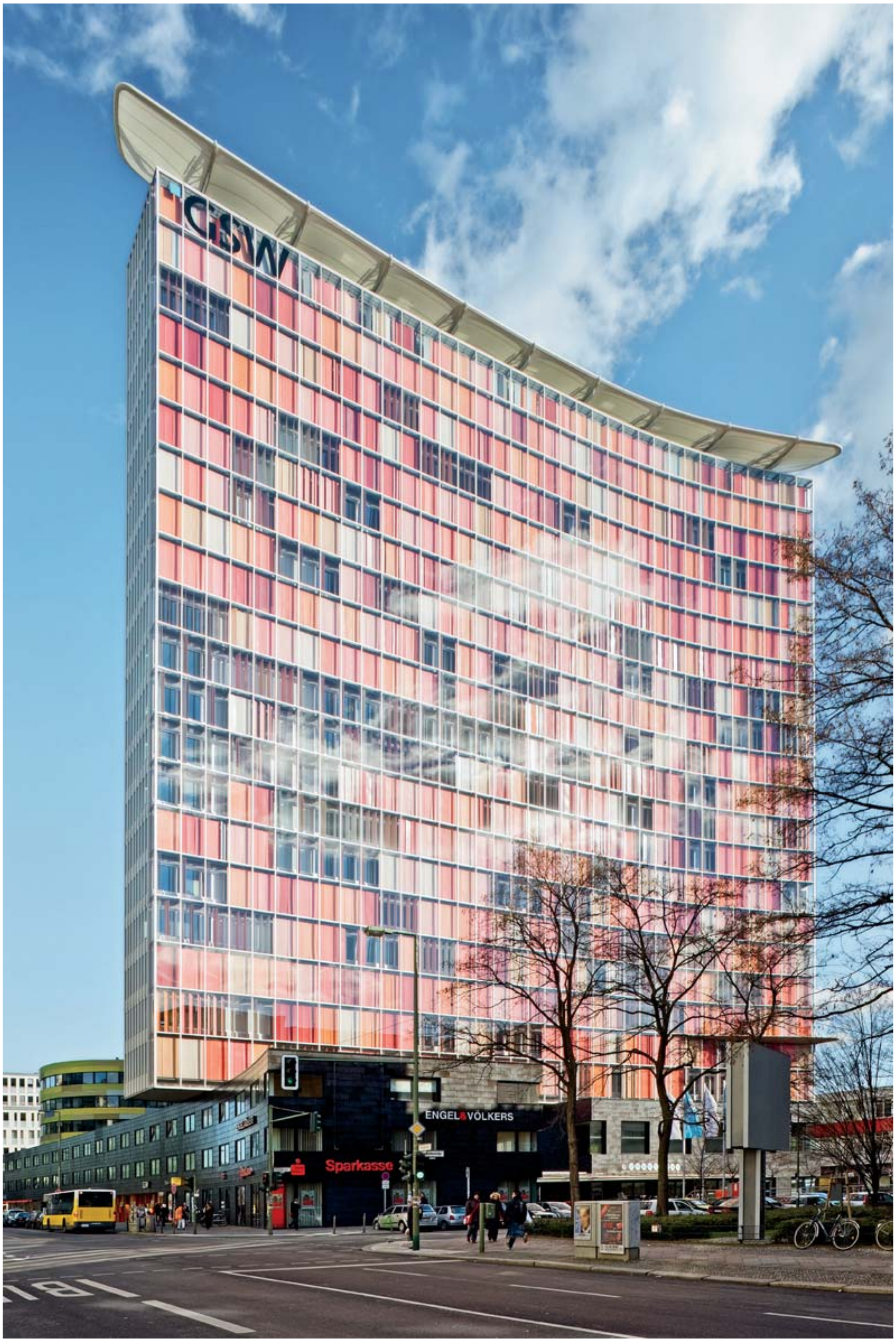


Figure 56: Centralized presentation of modern high-rise building

Figure 57: Inclusion of immediate surroundings of a building left to decay

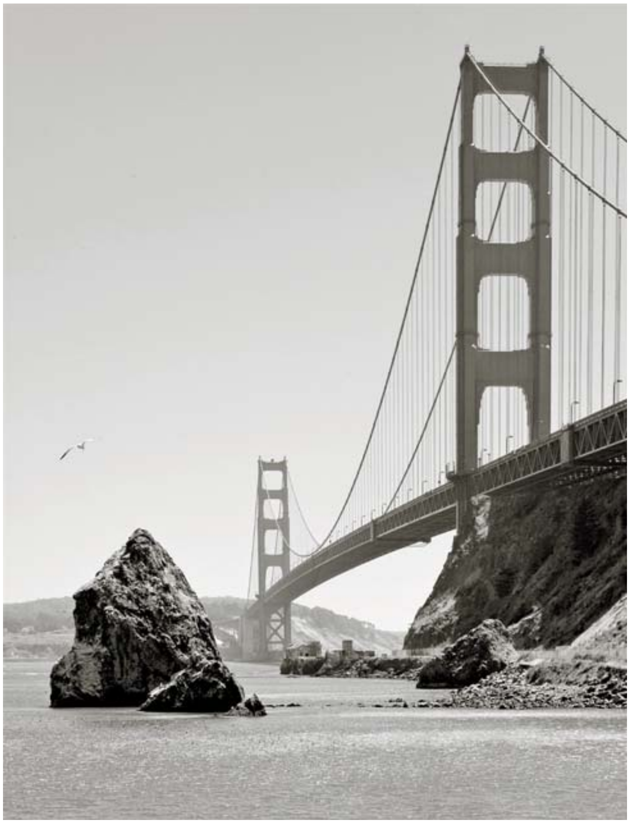


Figure 58: A bridge as a subject of an architectural photograph

a state of decay, may be more intriguing when viewed as part of their environment (figure 57).

It is important to notice the many different manifestations of architecture—from churches, castles, and palaces of centuries past all the way to modern industrial complexes or warehouses reduced to their purely functional qualities. Unusual modern buildings are part of architecture, as are the residential buildings found in any city. Even bridges, temporary buildings, pyramids, air raid shelters, broadcast towers, and outhouses are presentations of architecture (figure 58). Given the right creative techniques, all of them can be the subjects of architectural photographs.

3.2.2 An Eye for Subjects

Fundamentally, a photographer needs to develop a good feel for situations and settings. This ability helps to separate the usual and mundane from the extraordinary and intriguing. Because architectural photography deals with stationery subjects, it is important to understand and utilize space and dimension. This begins before the shot with the selection of the best viewpoint and method of showing a subject. No amount of digital processing afterwards can compensate for diligence in this first stage. If the picture is not correctly captured at the moment of exposure, even intense post-processing cannot magically produce an exciting image.

Unfortunately, the ability to recognize a potential subject or scene is not equally available to all people. Some photographers can easily find exciting vantage points and incorporate the scene presenting itself in front of the camera into a photographic composition. These people can look at a potential subject and already envision a photographic image, while others may not even notice the subject's potential. But the latter group is not automatically destined to produce poor photographs. A quote from Ansel Adams may be a consolation: "Twelve significant photographs in any one year is a good crop". The following statement is even more important: Without any doubt, the feel for situations can be trained and improved.

So how can we train ourselves photographically? In order to sharpen one's senses, it is beneficial to repeatedly visit places with a variety of architectural subjects.

Digital photographers should make use of voluminous memory cards and not shy away from taking large numbers of shots (figure 59). A careful evaluation of the images will quickly show which are good, which should be deleted immediately, and what can be done better next time. By using this quantitative method, a photographer becomes more familiar with the particular traits, advantages, and disadvantages of a place. Along the way, new angles, viewpoints, and ways to record a subject will be found. Over time, this leads to steadily improving shots.

Another method to begin sharpening one's perception for a subject is to shoot overviews of places with interesting architecture. Later, these images

Figure 59: Different depictions of the same location

can be carefully studied and analyzed to identify which parts of the pictures would yield more interesting views or subjects (figure 60). The computer allows us to crop frames and experiment with different emphases and compositions. Having these ideas in mind makes the next visit to a place much simpler, with potential subjects and angles already identified (figure 61).

Yet another method is the deliberate analysis of photographs contained in architectural books. These questions should be asked: How has the photographer staged the building? How is the image composed? Why was this particular angle chosen? What would I have done differently? Exposing oneself to professional images produces new experiences and new realizations that can be integrated into one's own photographic work.

Figure 60: Overview with various subject concepts

Figure 61: Photographically realized subject concepts

Figure 62: Comparison: Unchanged perspective from identical shooting location despite different focal lengths [focal length: 17 mm and 35mm]

3.3 Perspective

Photography turns a three-dimensional space into a two-dimensional image. This conversion follows the laws of perspective, which represent the effect of a subject's space and depth in a two-dimensional plane. Perspective is fundamentally the projection of space onto a flat surface. Photographic images follow the rules of central projection, also called vanishing point projection, preserving the natural perception to which the human eye is accustomed.

Perspective is determined by the camera's position; the spatial relationships within the image change only when the camera is moved. There is a common belief that perspective is influenced by focal length, but this is not so. The different impression and wider view of a short lens are created because a larger picture frame is shown. However, the spatial proportions in an image do not change with different focal lengths (figure 62).

3.3.1 Roles of the Vanishing Points

Because geometric shapes are so important in architectural photography, perspective vanishing points have particular significance. If parallel lines in three-dimensional space extend into the distance, a photographic image will represent them as intersecting on a defined vanishing point (Vp). If the camera points at the horizon, all truly vertical lines also remain vertical on the image. This is a fundamental principle of photography, and it is often used in architectural photography.

The number of represented vanishing points has an important bearing on the overall impression of a depicted building. In **central perspective** (not to be confused with central projection), all parallel lines going into the distance end up at a vanishing point located in the middle of the picture and at the horizon. In the practical application, the photographer faces the building from the front, and the camera is aimed horizontally at the horizon. This places the building's façade parallel to the film or sensor. Such a camera position shows all of the façade's parallel lines and edges as parallel lines in the photograph (figure 63). Although this type of shot looks calm, it is also rather unspectacular. For some subjects it is also too two-dimensional and flat, because the building's heft can hardly be seen.

Two-point perspective, is defined by two vanishing points on the horizon. Such an image shows a building from its corner. As with the central perspective, the camera has to be aimed horizontally, but only vertical lines are represented as parallels in the final image (figure 64). A typical image in two-point perspective has a much more dynamic and three-dimensional appearance, showing a

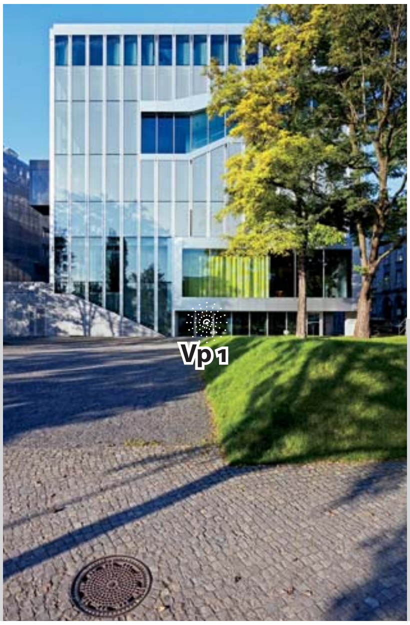


Figure 63: Building in central perspective

Figure 64: Building in two-point perspective

building's voluminous size. On the other hand, this effect can also obscure architectural features because the photograph's dynamic qualities can distract from a purely architectural impression.

Photography with three vanishing points is often referred to as "worm's eye view" (figure 65) and "bird's eye view" (figure 66). The camera is not aimed at the horizon, but rather at an imaginary point either higher (worm's eye view) or lower (bird's eye view) than the horizon. This type of perspective occurs in all cases when the camera is tilted up or down, because there is no other way to fit the entire building into the frame. Since the viewer does not look at the building head on, there are no parallel lines. Even vertical lines converge in a point located above or below the image. This is called "perspective projection distortion".

Figure 65: Worm's eye view

Figure 66: Bird's eye view

Figure 67: Architectural photograph with slightly converging verticals

Figure 68: Perspective correction with shift lens

3.4 Perspective Distortion and Converging Verticals

In the real world, the human eye does not consciously notice converging verticals. Our visual perception is tied to our sense of balance, which compensates for these visual anomalies without us even noticing. But in two-dimensional imagery, things are different. Our brain does not process these images in the same way and realizes that something isn't right. If converging verticals approach each other at a mild angle, a picture can create a restless impression, and a depicted building's aesthetics may be compromised (figures 67, 68). This impression can be so strong that the building almost seems to lean over backwards (figure 69). For this reason, it is important to avoid perspective distortion in architectural photographs as

Figure 69: Architectural photograph with distinctly converging verticals [focal length: 14 mm]

much as possible. If a building's edge is really vertical, it should remain so in a photograph. This prevents unwanted notions of disharmony in the composition and also enhances the building's exact representation.

Is it advisable to avoid converging verticals in every situation? Not necessarily. There are times when converging verticals can and should be used as a stylistic technique by exaggerating their manifestation. In such cases, converging verticals can be the most important stylistic element in the composition. Typical uses of this technique are photographing high-rise buildings and any other buildings where the photographer must be very close and look up at the subject (figure 70).

Figure 70: Converging verticals as a main style element in the image composition [focal length: 28 mm]

3.4.1 How to Avoid Converging Verticals

To represent a building without converging verticals is not always unproblematic. The closer one comes to the building, the more difficult it is to avoid converging verticals. The reason is that the camera has to be tilted up in order to fill the frame. So how can truly vertical lines remain photographically vertical as well?

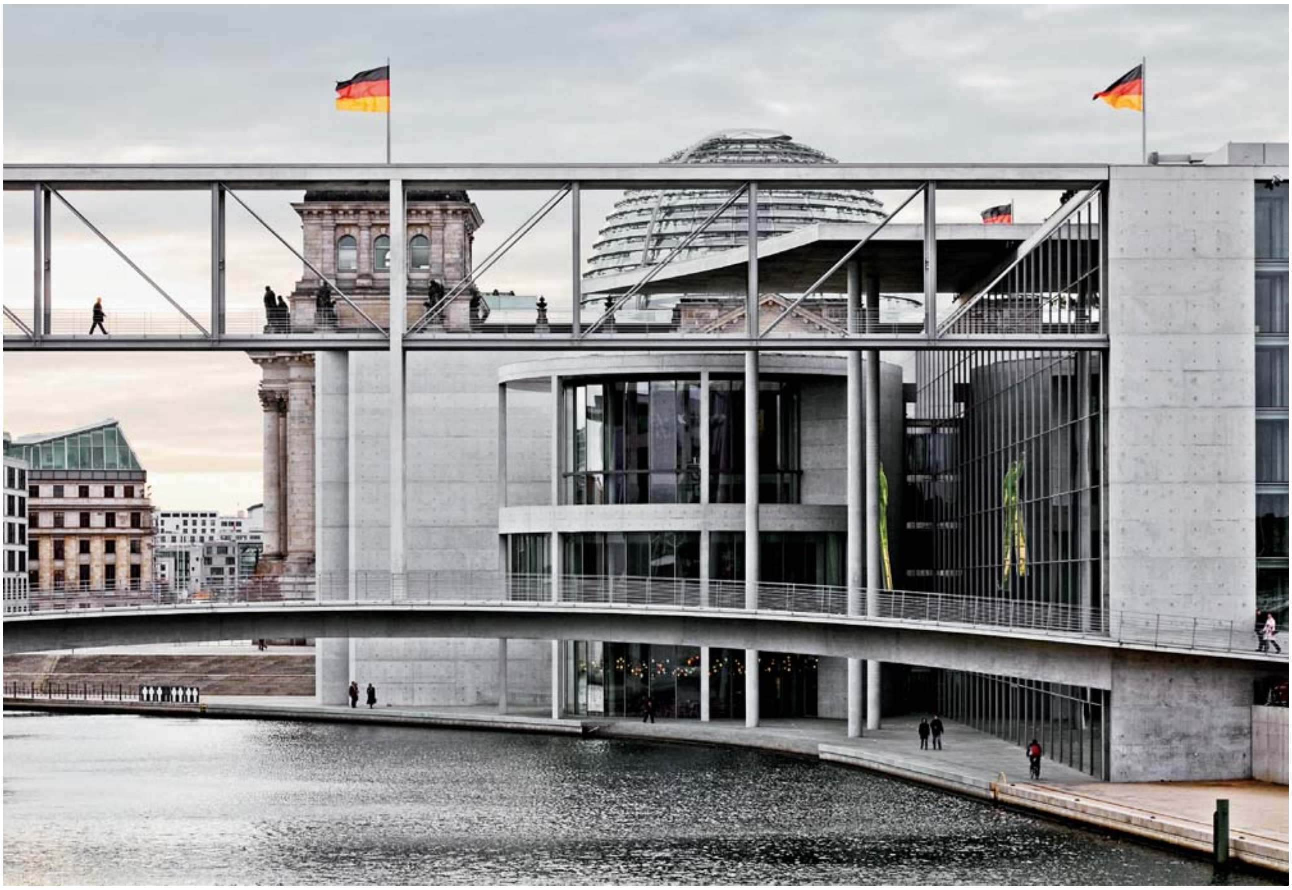


Figure 71: Avoiding converging verticals by shooting from a great distance between camera and subject [focal length 90 mm]

Greater distance from the subject: The first method of maintaining vertical lines is to simply move back. If there is enough freedom of movement to do so, a longer focal length can compensate for the increased distance (figure 71). This alone is enough to markedly decrease perspective distortion or even avoid them, particularly if the camera is set level with the horizon. Small corrections can be done later on the computer. Unfortunately, this simple increase in distance is often impossible in real settings. In many instances, the building's surroundings will either be occupied or inaccessible. Another problem is the increased risk of including unwanted objects in the frame that obstruct the view or disturb the composition. Finally, the greater distance from the subject results in a distinct visual compression of the perspective representation, and this effect is not always welcome (section 3.5.5).

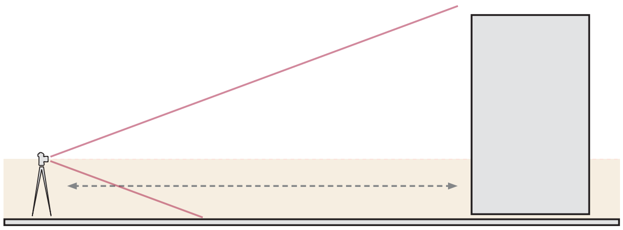
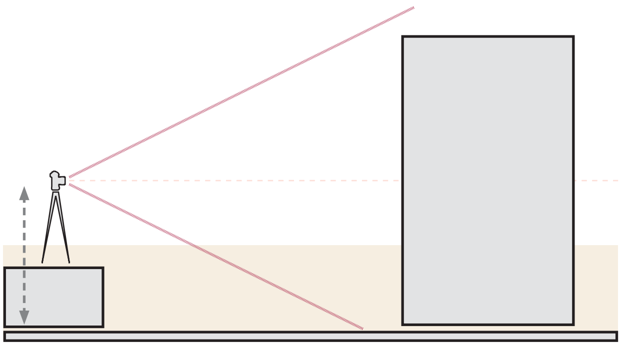


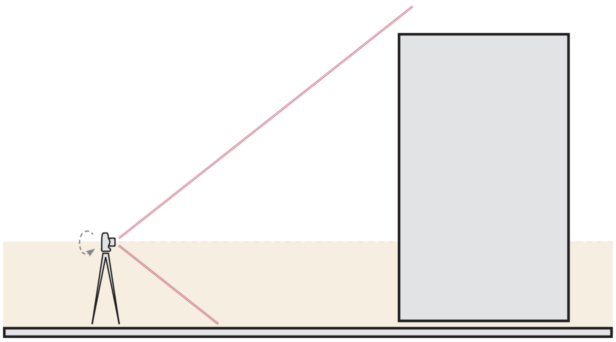
Figure 72: Avoiding converging verticals by shooting from an elevated position [focal length: 50 mm]



Moving to higher ground: Elevating the camera is another way to avoid converging verticals (figure 72). In an ideal scenario, the camera is moved upwards to half the building's total height, and then pointed horizontally level at the building. Thus, converging verticals can be avoided. The higher vantage point automatically results in a vertical composition. Unfortunately, few buildings have conveniently located bridges, platforms, or higher floors of adjacent buildings accessible and at the right distance.

Figure 73: Avoiding converging verticals by shooting in portrait orientation with a wide angle lens and cropping the image [focal length: 14 mm]

Use of short lenses in portrait orientation: This method can be used to avoid converging verticals caused by close proximity to the building. It uses wider lenses than necessary to frame the entire building. The portrait (vertical) orientation enables the camera to remain level with the ground while showing the entire building (which will move toward the top of the frame). Of course, this approach incorporates a large area in front of the building and produces an unbalanced composition, but this can easily be corrected by cropping the image in digital post-processing (figure 73). The disadvantage of this method is that the total image size will be smaller.



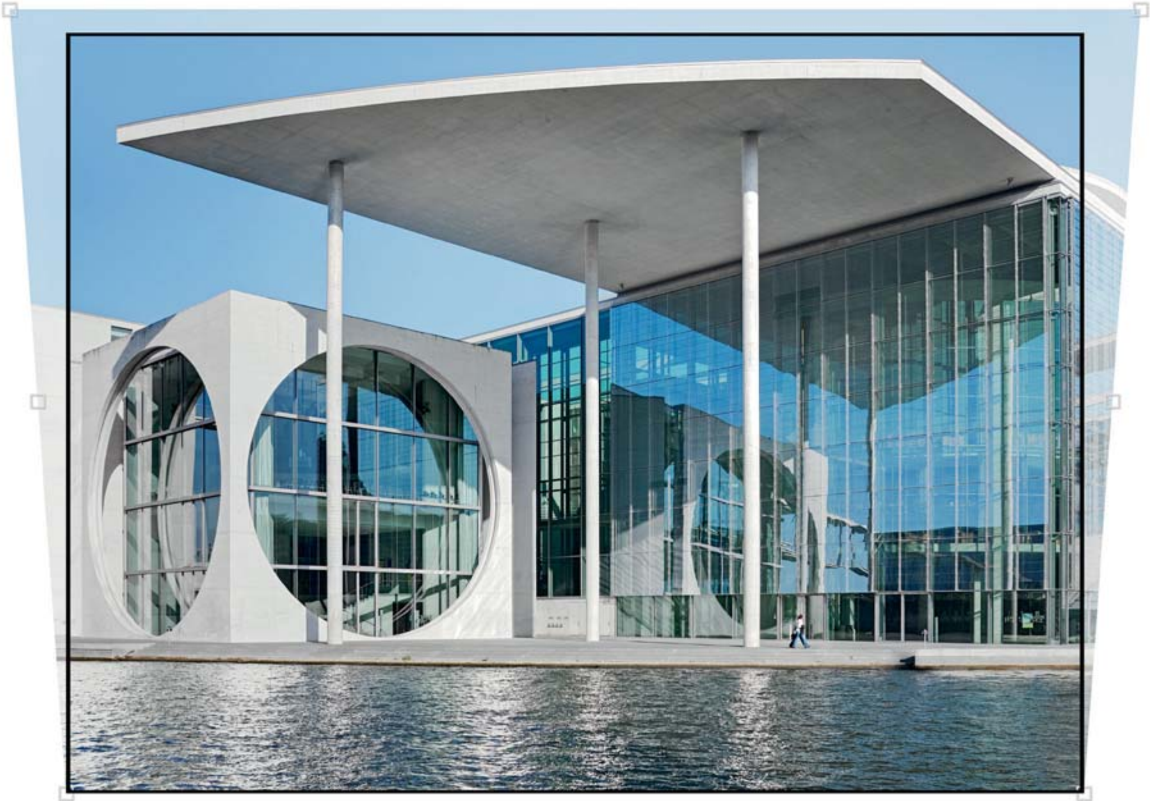
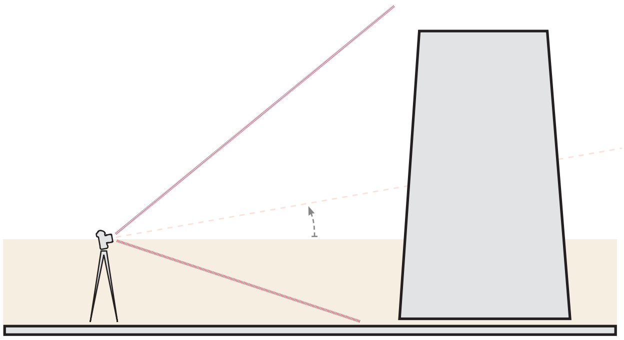


Figure 74: Perspective correction of converging verticals using software [focal length: 32 mm]



Perspective corrections on the computer: A widespread and nearly always possible method consists of photographing with perspective distortion and then making corrections on the computer with image editing software. The image editing corrections involve a trapezoidal distortion of the entire image that causes the converging verticals to separate from each other (figure 74). A downside of this method is that it produces an unevenly distributed resolution of details over the entire picture surface. The pixels in the lower area of the image are slightly compacted, while the pixels in the upper part of the image move away from each other. If the perspective distortion is very strong, then this method can seriously compromise the resolution and may reach the limits of what is possible by artificially creating image data for the upper areas of the picture. Therefore, this method is best used in combination with one of the other suggestions above. For example, in addition to digital post-processing, a wide lens can be used in the horizontal format with the camera tilted only slightly upward.

Figure 75: Perspective correction of converging verticals using a shift lens [focal length: 35mm]

Use of a shift lens: The best but also the most elaborate way to do perspective corrections is to use a specially designed shift lens. Within its parameters, the shift lens allows the corrections to be made right on location (figure 75). Further processing on the computer is unnecessary, which not only saves time but also prevents otherwise unavoidable image degradation. In addition, the desirable frame can be selected immediately and there is more freedom in choosing the camera position.

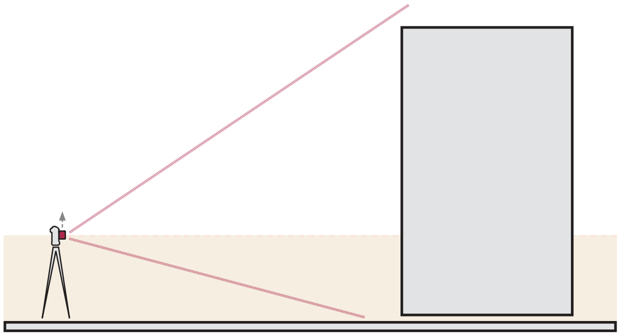


Figure 76: Perspective correction by vertical shift of the optical axis, using a shift lens

Figure 77: Perspective correction by vertical shift of a medium format lens using a shift adapter

3.4.2 How Does a Shift Lens Work?

Because of their special design, shift lenses can move their optical axis in relation to the film or sensor surface (figure 76). With regular lenses, this would lead to an extreme light fall-off at the edges. Shift lenses produce a much bigger image circle and can be moved as much as 12 mm in each direction. Their design usually does not include functions such as autofocus and, in some cases, automatic aperture control, but these disadvantages do not present a real problem.

As an alternative to the shift lens, it is possible to use a medium format lens combined with a shift adapter on a regular full-frame SLR camera. The effect is similar to a shift lens (figure 77). This can be done because the image circle passing through a medium format lens is much larger than that of a lens designed for 35mm format alone. In addition, the medium format's larger flange focal distance has plenty of room to spare for a shift adapter. However, the maximum possible shift area is limited with this setup also, and extreme perspective distortions cannot be fully undone.

How is a shift lens used? In the first step, the camera and shift lens are aimed at the building horizontally and level. A spirit level integrated into the tripod or attached to the camera's hot shoe makes this task much more precise. Light and distance metering takes place in this neutral position. This is important since most cameras will not make accurate measurements when the lens is in the "shift" position. Once this is done, the optical lens axis can be moved up, which moves the horizon in the viewfinder down. Areas that were cut off at the top of the image frame now come into view (figure 78). Although the camera now shows major parts of the image above the horizon, camera and lens are still level with the ground, resulting in no perspective distortion.

If the vantage point is high, the entire process can be reversed by shifting the lens down instead of up (figure 79). However, in both scenarios, there will be a visible light fall-off towards the edges and blurring in the corners of the image, toward maximum lens shift. The maximum shift position should therefore be used only as a last resort. If the maximum shift is not enough, it is best to use a combination of lens shift and a slight tilt of the camera. This minimizes perspective distortion to the point where it can be corrected in the computer without much loss in quality.

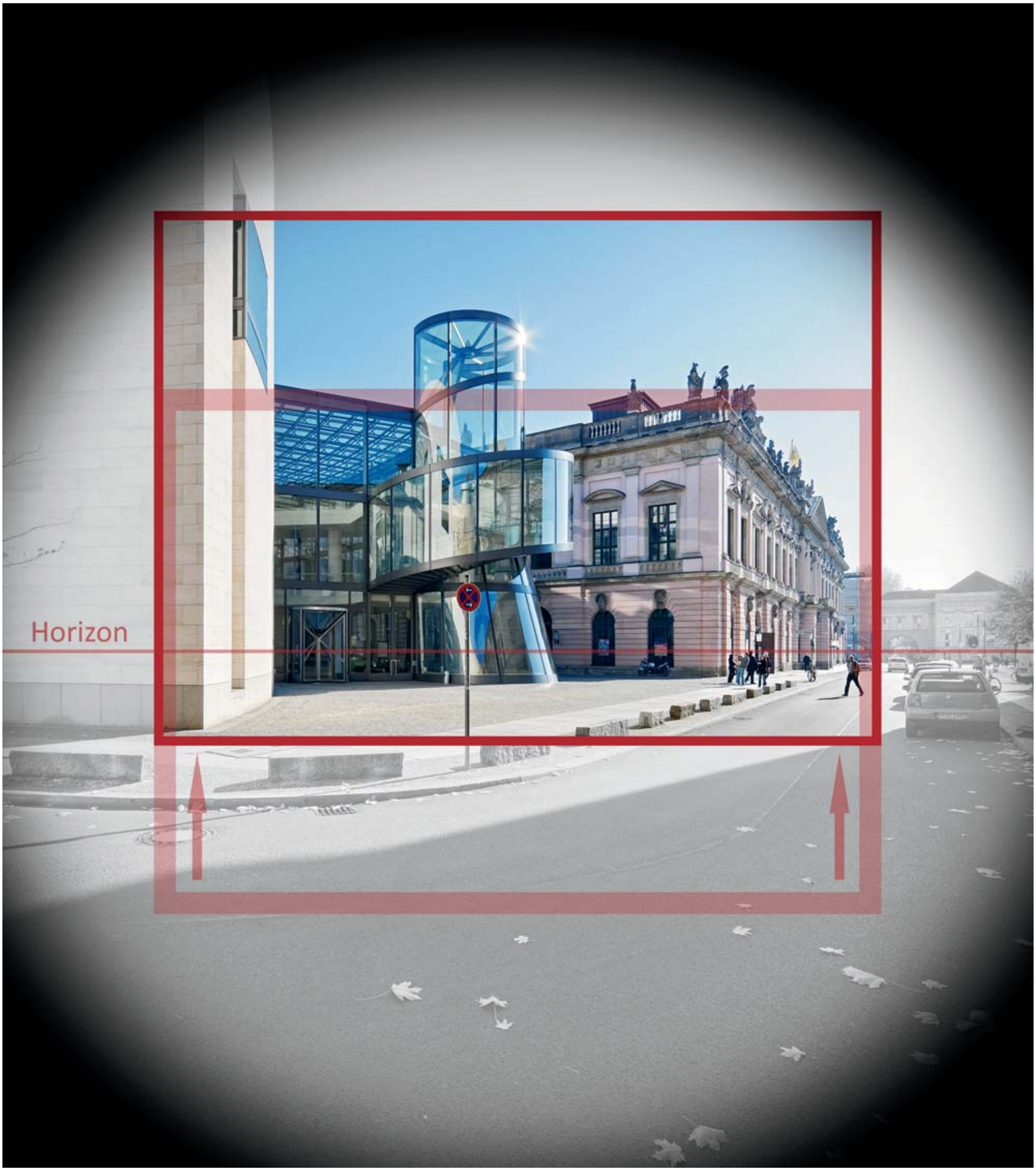


Figure 78: The shifting technique: orientation on the horizon and shifting of the optical axis within the image circle

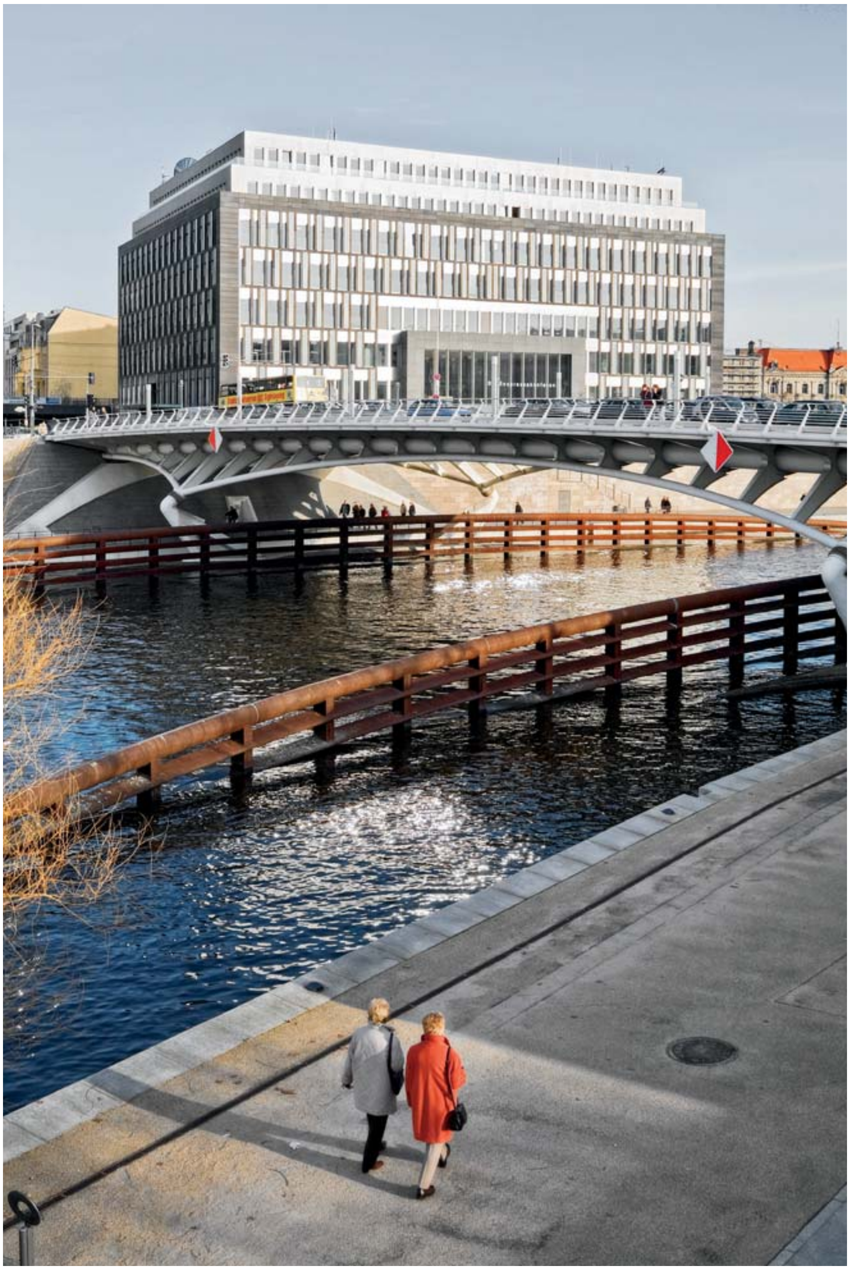


Figure 79: Image with optical axis shifted downwards [focal length: 35mm]

It is interesting to note that the shift lens can be employed not only vertically, but also horizontally. This can be useful in a case where a house façade must be photographed from central perspective without an accessible vantage point in the middle. In some cases, the photographer may also have to deal with his own reflections on a façade. The shift lens makes it possible to choose a position further to the side without converging vertical or horizontal lines (figures 80, 81).

In addition to preventing perspective projection distortion, the shift technique can also improve a composition. For instance, it enables the photographer to lose a disharmonious foreground in the lower part of the image and instead draw more sky into the upper part (figures 82, 83). Another application of shift lenses is the creation of small panoramas, because the angle of view as well as the total resolution can be significantly increased (section 3.6.3).

Some shift lenses have added tilt capability so that the focus plane of the lens can be tilted according to the Scheimpflug principle. However, architectural photographers use this only in rare cases. One such situation would be when the photographer is very close to a façade leading into the distance, and the entire façade must be shown in focus. Owners of shift-tilt lenses should always make sure that the tilt setting is locked level if only the shift function is desired. If this step is neglected, some picture elements may be out of focus, even if the aperture is small.

Figure 80: Object on the centerline of the image disturbs the composition [focal length 24 mm]

Figure 81: Slightly changed perspective (compare red circles) by moving camera position to the side ("shift" to the left) [focal length 24 mm]

Figures 82, 83: Comparison: changes in image composition resulting from different shifts [focal length: 24 mm]

Figure 84: Short distance between camera and subject produces dramatic perspective [focal length: 14 mm]

Figure 85: Close camera position resulting in a disadvantageous view of protruding building parts from below [focal length: 24 mm]

3.5 Camera Position

As mentioned earlier, the camera position is the only factor responsible for a building's appearance in perspective. Because of this, the vantage point of choice must be well thought out, as it is of utmost importance for the following steps. Even slightly altered camera positions can dramatically change a building's appearance in a photograph.

3.5.1 Ideal Distance to the Building

The optimal distance is variable, depending on the type of building and its dimensions, the surrounding environment, and the photographer's concept.

If the depth of a building must be shown, then the camera's distance from it must not be too great because this would lead to a flat appearance (section 3.5.5). Also, if there are many distracting objects around the building, the photographer must move in closer to have an unobstructed line of view. However, if the building must be shown with its true and undistorted proportions from the front, the distance should be greater. Also, an enormous building must be shot from further away than a small building in order to achieve a natural-looking perspective.

The most severe problems usually arise with extreme vantage points that are very close or very far from the building. Too close, and converging verticals cannot be brought under control by any means. In such situations, distortions must be purposefully and deliberately made a part of the composition. While this can lead to exciting and dynamic images, the architecture appears increasingly devoid of realism (figure 84). In cases where the photographer is very close, but a perspective correction could theoretically still be possible, it is best to seriously consider the position. When in doubt, the distance should be increased. Otherwise, the narrow distance to the building leads to surreal and unnatural-looking architecture, perspective correction notwithstanding. One reason is the dominant visual effect created by looking up at the underside of protruding features high up on the building, such as balconies and windowsills (figure 85).

A long distance between the camera and the building rarely causes converging verticals to form, and these can easily be corrected. On the downside, unwanted objects around the building often compromise such images. Another issue is that such pictures tend to depict architecture as unnaturally flat and two-dimensional, and they downplay the building's depth. Between the two extremes, the latter usually causes less of a problem and might in some cases be used as a stylistic technique (figure 86).

All in all, the rule of thumb is that the best camera positions are located at a distance of about one to three times the height of the building. This distance rule is one of the reasons for the predominance of relatively wide lenses in architectural photography.

Figure 86: Large distance between camera and subject produces only minimally converging verticals [focal length: 150 mm]

3.5.2 Position and Perspective

Even if the main subject itself does not change, depending on the camera position, it can have a fundamentally different perspective appearance. This results in changes to the image frame, which can easily be compensated for by changing the focal length. Deliberately choosing the right camera position can influence the entire composition. Experienced photographers use this principle to accentuate certain characteristics of a building, for example the quality with which it was drafted (figures 87, 88). In the same way, the negative traits of a building can be masked or pointed out. A carefully chosen position helps to illustrate proportions and relations in architecture, or it can lend different weight to specific parts of a building (figures 89, 90, 91). The same architecture may look calm and clear from some vantage points but dramatically

Figure 87: Large distance between camera and subject resulting in large and monumental depiction of building [focal length: 200 mm]

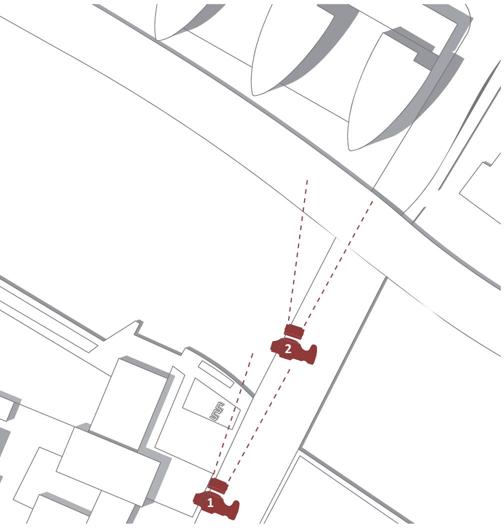


Figure 88: Smaller distance to building making it appear more slender and pointed [focal length: 100 mm]

Figure 89, 90, 91: Comparison: various proportional distribution through changing camera position [focal length: 17 mm, 35mm, 50 mm]

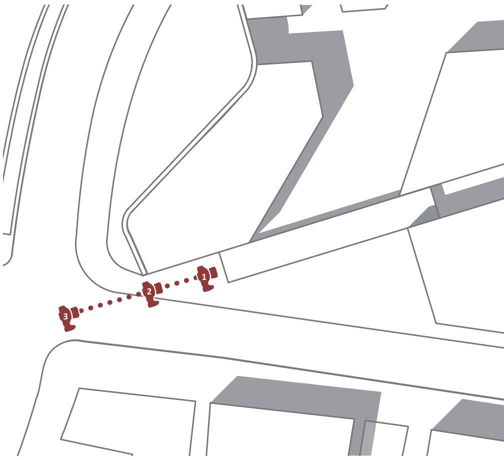
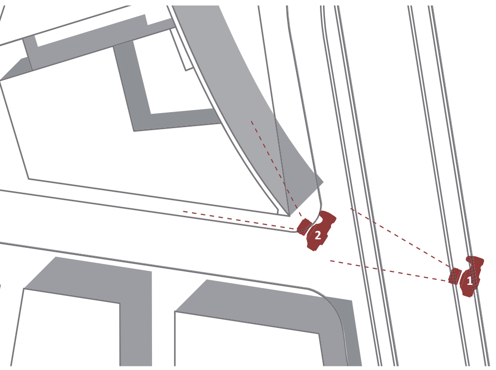


Figure 92: Moderate distance between camera and subject resulting in a realistic depiction of depth [focal length: 58 mm]

Figure 93: Close distance between camera and subject leads to a dramatically exaggerated architectural presentation and extreme depiction of depth [focal length: 12 mm]

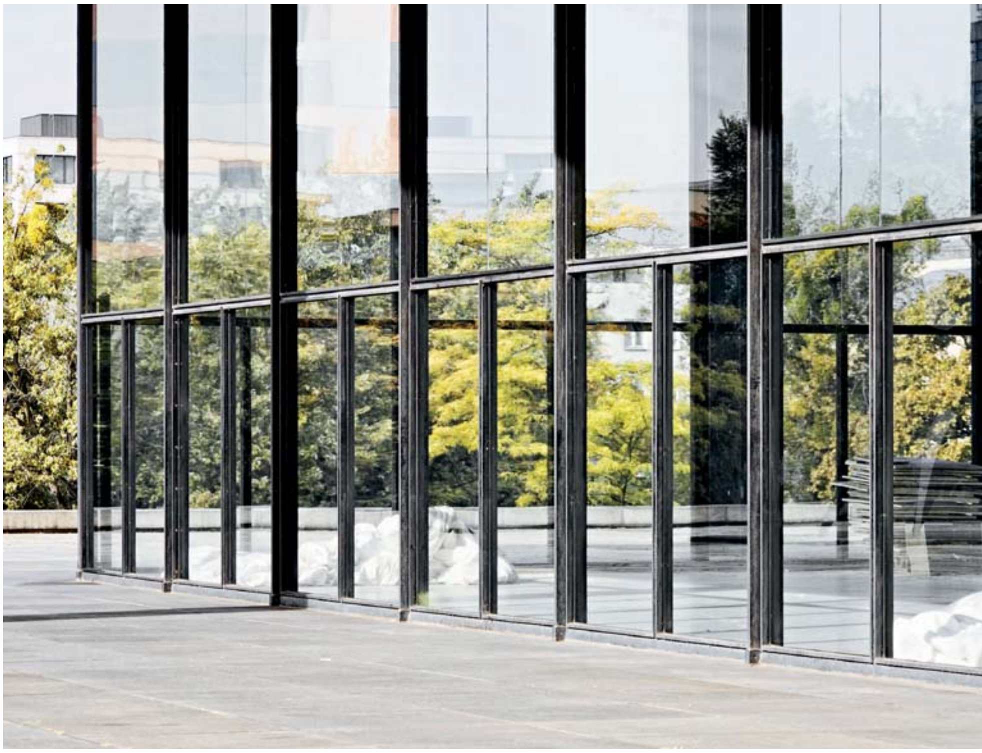


surreal from others (figure 92, 93). A façade may appear transparent and open from one view but tightly shut from another (figure 94, 95). Moving the camera position by just a few feet can make a huge difference.

By employing these methods, the photographer can influence the impression a building makes without the viewer being consciously aware of it. As a result, the impression of a building gained on location can be very different from the perception gained through a photograph. The photographer must be aware of the effects of the camera position even before the shot is made. It comes down to what the photographer desires to show and what points communicate the photograph's message. Negative effects of an ill-chosen position can rarely be corrected afterwards.

Figure 94: Closed appearance of a façade, camera position and angle lead to the fence-like appearance with little glass visible in between the posts

Figure 95: Transparent appearance as a result of a different camera position, and a bigger viewing angle of the façade



3.5.3 Position and Environment

A change of position not only causes a shift of perspective, but also has considerable influence on the elements surrounding the subject. The environment can have a positive or negative impact on the composition and the architecture depicted. Only when a building stands in the middle of nowhere does the photographer have unlimited freedom to concentrate entirely on its photographic representation. Whenever this is not the case, the photographer is forced to deal with the immediate vicinity and choose the camera position accordingly.

A theoretically interesting view of a building may not be all that exciting if the view is obscured, for example by vegetation. If this is a problem, a small adjustment to the position of the camera is often all it takes to resolve the problem (figures 96, 97). In addition, the purposeful choice of positions makes it possible to create a variety of moods and thereby show the building in several different ways (figures 98, 99). The weight and emphasis that the photographer assigns to elements of architecture and the surroundings are also influenced by the camera's position. (figures 100, 101). Consequently, the photographer's skill does not only pertain to finding the perfect viewing angle, but also to incorporating the environment into the final composition.

Figure 96: Disharmonious foreground disturbs the composition

Figure 97: A slight change of the camera position results in a much better presentation of the architecture

Figure 98: Roadway is overpowering the composition and visually separates the viewer from the building; area in front of building becomes insignificant [focal length: 24 mm]

Figure 99: Slightly modified camera position leads to a very different effect: building becomes directly accessible; the square in front of the building appears larger and wider [focal length: 24 mm]

Figure 100: Building and external space in front dominates the composition; the sculpture is subordinate [focal length: 24 mm]

Figure 101: Different camera position making sculpture dominant [focal length: 24 mm]

Figure 102: Camera position on the diagonal axis depicting the building as massive and monumental

3.5.4 Position and Symmetry

Figure 103: A symmetrical depiction shows an open, inviting interior space

Photographs with symmetrical features always create an extraordinary impression. However, one needs to distinguish between the symmetry of architecture and photographic symmetry. Even if the architect designed the building to be symmetrical in shape, the photograph may not necessarily show it as such. But if the building's symmetry aligns with that of the photograph, the resulting image will be particularly dynamic. Most viewers tend to perceive such images as highly satisfying because their inherent sense of balance leads to a powerful and extraordinary visual experience. The building seems more monumental and impressive, but sometimes also more synthetic and less realistic (figure 102).

In order to use symmetry as a stylistic device, the photographer must place the camera exactly on the building's symmetric axis and align the camera's aim with it. The slightest pan or step to the side can ruin the effect by causing undesirable tension within the composition. Highly dynamic symmetrical shots can be achieved along the building's diagonals because they bring out the entire depth of the building. Courtyards (figure 103) and round or elliptical façades (figure 104) are also ideal subjects that yield impressive pictures as long as the photographer gets close enough.

The magnitude of the symmetrical effect always depends on the sides of the building being visible and leading into depth. Since a building's depth cannot be seen from the front, the dynamic effect is widely missing. The symmetry of such a picture suggests balance and tidiness, but the dramatic tension of symmetrically dynamic lines is not present (figure 105).

Figure 104: Symmetrical image creating a closed, compact architectural body

Figure 105: Less symmetrical effect as a result of concealed building depth

3.5.5 Depth Perception

The way depth is perceived in an architectural photograph depends on the chosen vantage point. If there are several objects located far away from the camera, the space between them seems tighter. This effect is sometimes referred to as “compressed perspective“. On the flip side, if the distance between the subject and the camera is very short, the foreground appears more prominent than the background. Close objects will appear very large, and objects farther away will appear much smaller. Spatial proportions will appear wider and more open.

In practical application, long distances call for telephoto lenses and short distances for wide lenses. Perhaps this gives rise to the myth that the perspective depth perception is a function of focal length. But it is possible to use a wide lens even with a long distance between the camera and the subject and then enlarge a cropped segment of the image later. It is also possible to use a telephoto lens with a short distance instead of a wide lens, shoot a series of mosaic pictures, and then stitch them together to make a large panorama. The depth perception would be the same for both methods.

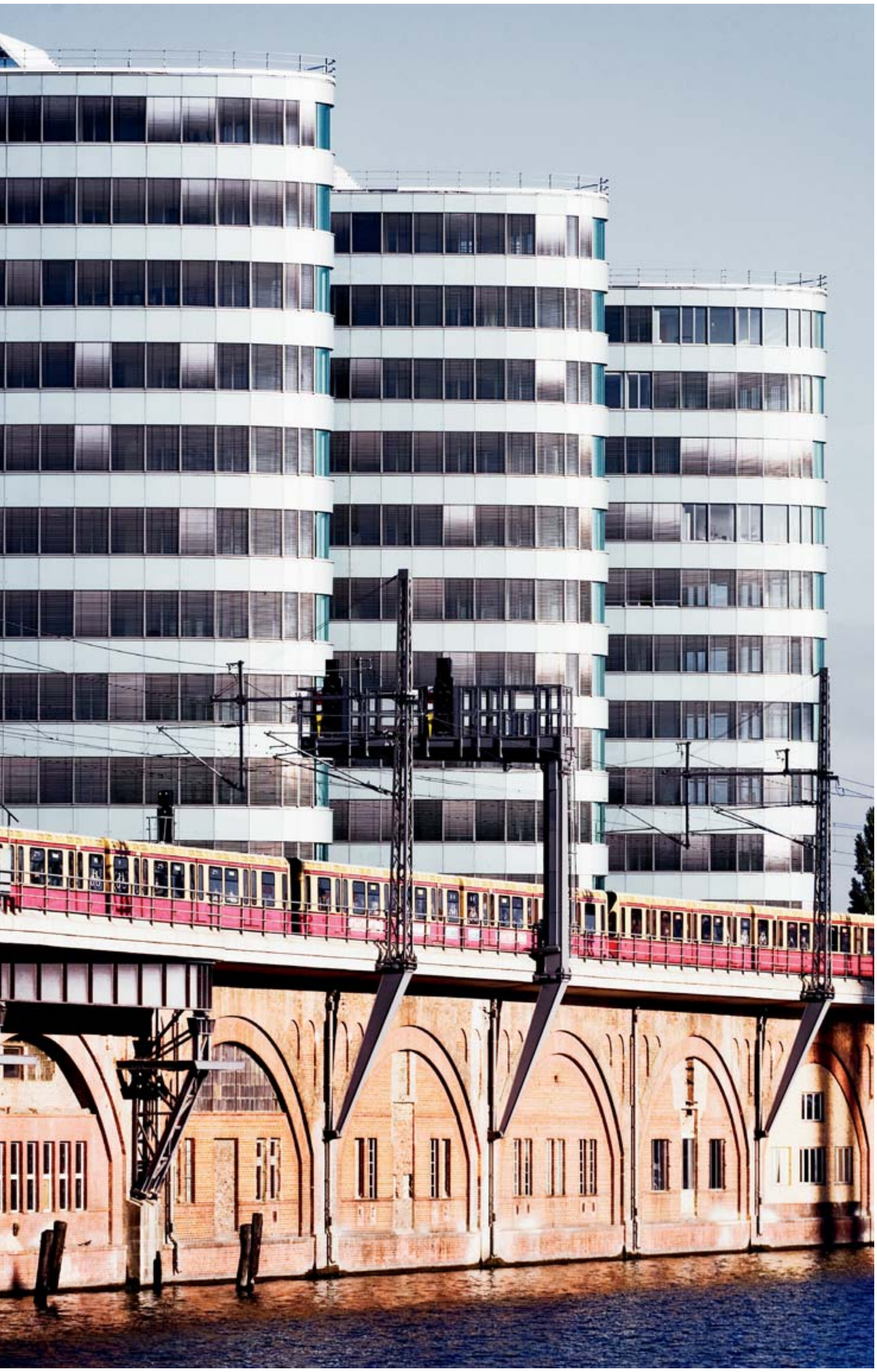


Figure 106: Large distance between the camera and the subject producing a compressed perspective [focal length: 180 mm]

It is also possible to shoot a building almost like a collage with very little depth. To do this, the distance between the camera and the building needs to be greatly increased. In the resulting image, the features toward the rear of the building are represented only marginally smaller than features on the front. Because of the compressed space, the building is represented in a very flat way with its three-dimensionality deemphasized. This method can be used to make very abstract shots that show spatial proportions in a surreal way (figure 106).

If the objective is pure documentation, photographers must try to represent the building's spatial characteristics as close to reality as feasible. For this purpose, it is desirable to use moderate wide-angle lenses wherever possible. On a 35mm format camera, a focal length around 40 mm leads—as a result of the adjusted distance from which the photograph has to be taken—to a depth effect in the image similar to the depth perception with the naked eye. In this manner, the viewer of a picture is able to realistically perceive the distances and proportions within the image by using his own visual experiences as a point of reference (figure 107).

The perception of an artificially wide architectural space can be created if the photographer closely approaches a building and corrects the frame by choosing a much shorter focal length. Because near objects seem large and more distant ones significantly smaller, an image with a small distance between the camera and the subject produces the perception of a deep space. This, in turn, produces

Figure 107: The camera position and a moderate focal length produce a realistic, spatial depiction of depth [focal length: 40 mm]

Figure 108: Close distance to the building and very short focal length result in an unnaturally wide appearance of the architectural space [focal length: 14 mm]

Figure 109: Close distance between camera and subject producing extreme perspective within the image [focal length: 17 mm]

the impression of spacious width (figure 108) or extreme perspective (figure 109) depending on the architectural circumstances. In contrast to photography over wide distances, where the viewer gets very little information about distance and relations of objects within the scene, the technique described above represents spatial depth in an exaggerated way, but only to the point where the viewer can still interpret it.

Figure 110: Telephoto lens enhancing building details in front of a flat background [focal length: 100 mm]

3.6 Focal Length

The choice of focal length is closely related to the choice of camera position. The exact method varies from photographer to photographer. Some photographers consciously choose a particular position first and then tailor the lens to it. Others prefer to choose a particular focal length first and then (within reason) move around to find the perfect spot.

Of course, owners of zoom lenses have more freedom to choose their position because the adjustments can be made gradually. Photographers who prefer to use fixed lenses often do more legwork, but this is hardly ever a serious disadvantage in the real world.

Because of their special optical effects, lenses with extreme focal lengths are rarely used in architectural photography. However, they do allow shots that would otherwise not be possible. Ideally, an architectural photographer will have a wide range of lenses to choose from, which greatly expands the range of possible camera positions.

3.6.1 Long Focal Lengths

As described earlier, long focal lengths are rarely used in architectural photography because they require the photographer to move far away from the building in order to capture it completely. Therefore, telephoto lenses are only used for special purposes.

Long lenses are perfect for emphasizing small details and building materials (section 3.8.3). But it must be understood that as the focal length becomes longer, the depth of field becomes smaller. This characteristic of long lenses can only be counteracted by stopping down the aperture as much as possible in order to avoid areas within the image that are out of focus.

Long focal lengths also mean a narrow viewing angle and a background less populated with details and visible objects. Therefore, the telephoto lens offers an opportunity to move certain parts of the building into the center of the composition, and also to separate them more clearly from a less dominant, flatter background (figure 110).

By utilizing the effect of compressed perspective caused by the large distance from the subject, a long focal length can show several buildings in an unusual virtual constellation (figure 111). With this technique and a clever choice of camera positions, buildings separated by a significant physical distance can relate to each

Figure 111: Long focal length and large distance producing a compacted view [focal length: 180 mm]

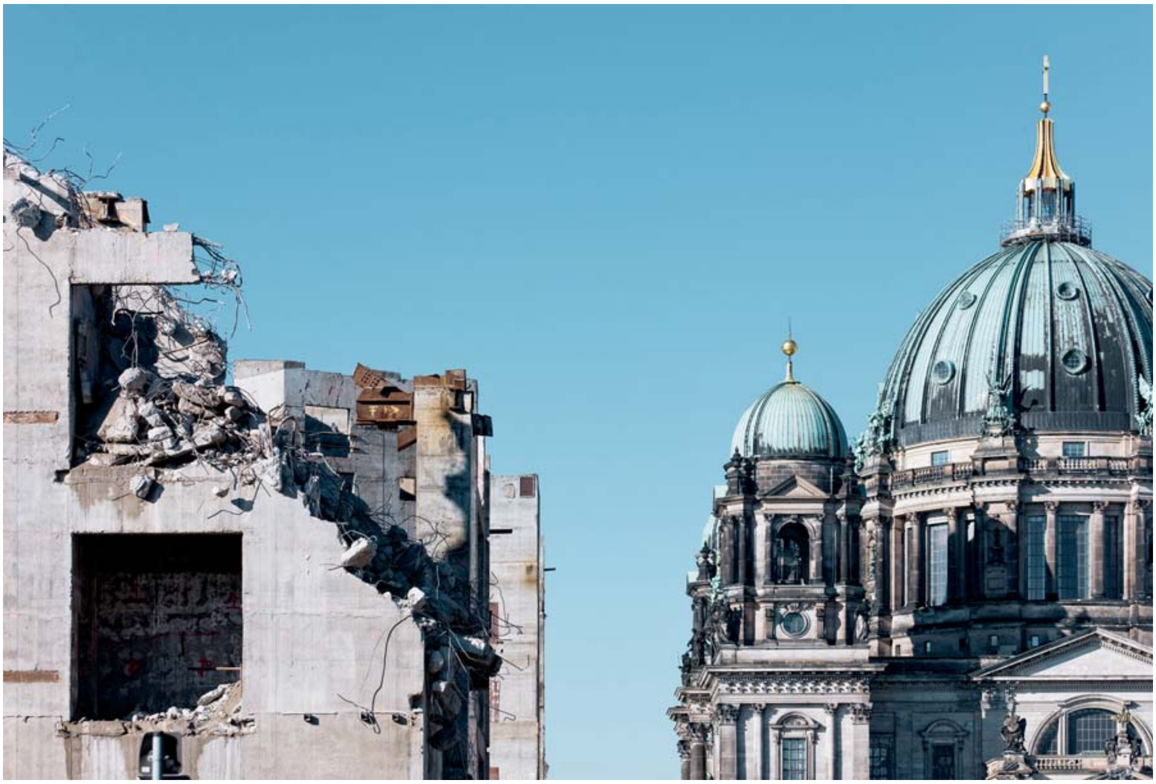


Figure 112: Long focal length producing a visual relationship between buildings that are distant from each other [focal length: 150 mm]

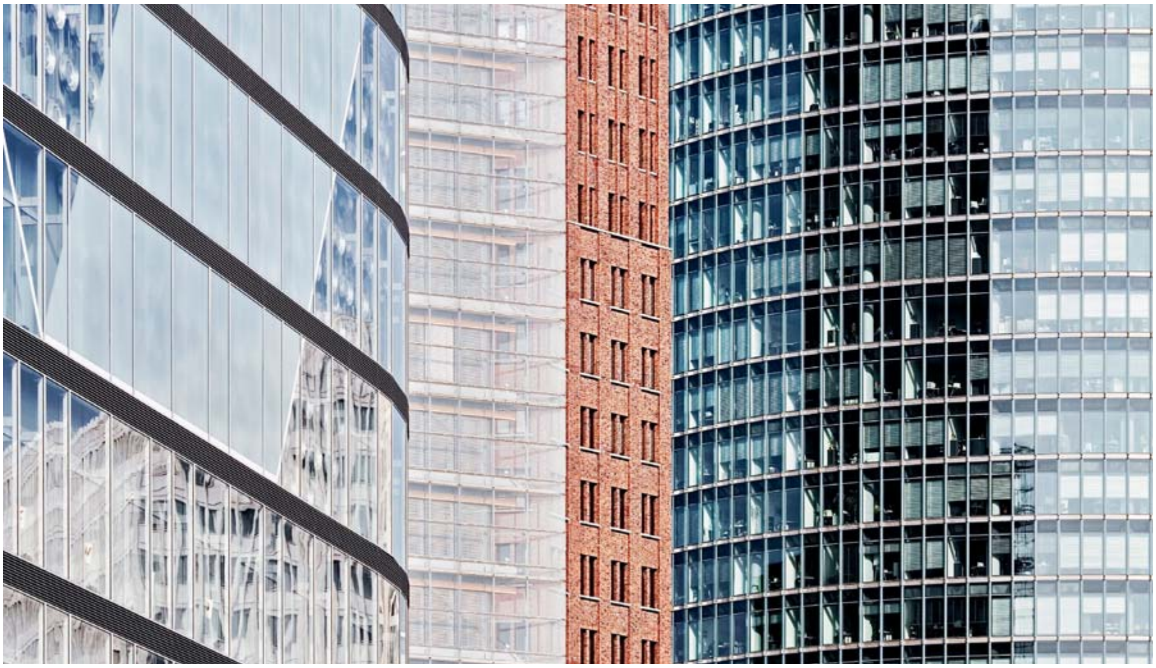


Figure 113: Focal length and framing produce a composition dominated by shapes and surfaces [focal length: 120 mm]

other in a picture (figure 112). In fact, they can be combined to such a degree that an entirely new visual expression arises. This is clearly an indication of creative architectural photography (figure 113).

3.6.2 Very Short Focal Lengths

Extremely wide-angle lenses enable the photographer to shoot very close to or inside a building. Short focal lengths make it possible to take photos in places that would not be feasible with moderate focal lengths. But in practice, photography in tight spaces with very wide-angle lenses leads to dramatic perspective and the appearance of unnatural width. Of course, this effect can be welcome for producing an artistically exaggerated representation. To apply it, the camera is placed in close proximity to the building. An unusual angle in combination with a very wide lens creates dynamic, but also strongly distorted, architectural images (figure 114).

Figure 114: An extreme wide angle lens, in combination with this special camera position, lead to a very dynamic look [focal length: 16 mm]

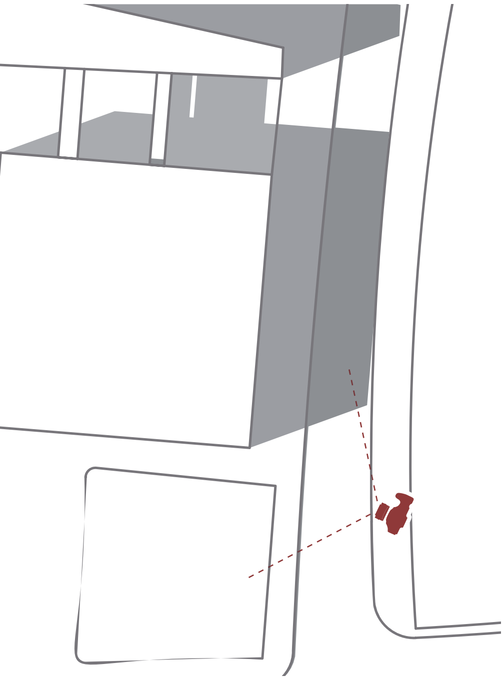


Figure 115: Neighboring buildings make a more distant camera position impossible and necessitate the use of a short focal length [focal length: 14 mm]

To achieve realistic documentation, only moderate wide-angle lenses may be used. Extreme wide-angle lenses are only permissible if the local conditions leave no other choice for positioning the camera (figure 115).

When using extreme wide-angle lenses, converging verticals result from the slightest tilt out of level position. This is often bewildering for photographers using these lenses for the first time (figure 116). To avoid this effect, it is essential to precisely aim the camera. Although short focal lengths cast good depth of field even with an open aperture, an architectural photographer should always reduce the aperture to avoid image problems.

Wide-angle zoom lenses are also afflicted by very visible barrel distortion, since such lenses are difficult to design with extreme focal lengths. It is advisable to leave enough space around the subject to allow for image correction later on the computer (section 4.3.1).

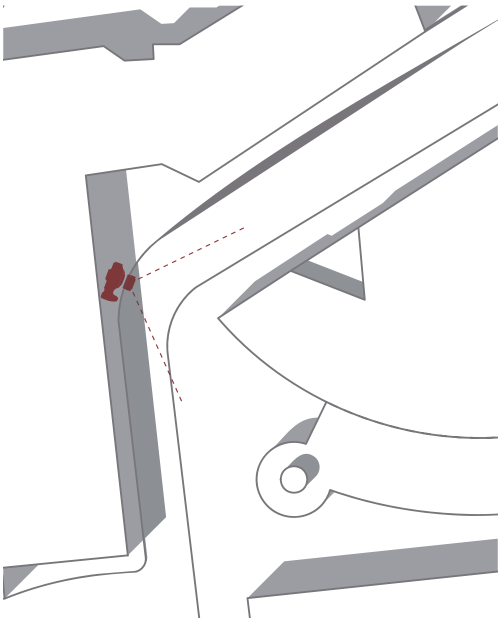
Fisheye lenses with extremely short focal lengths are rarely used in architectural photography because they produce images with bizarre distortions. However, in special cases these lenses are good for interesting experiments with unusual views (figure 117).

Figure 116: Slight camera tilt downwards combined with a very short focal length lead to strongly converging verticals [focal length: 14 mm]


Figure 117: Fisheye lenses produce extremely distorted representations of architectural reality

Figure 118: Rectilinear panorama consisting of three shots in portrait orientation [focal length: 17 mm]

3.6.3 Expanding the View: Rectilinear Panoramas



If the focal length of a lens is not sufficiently short to show the entire building, panoramas provide another option. Two or more staggered, vertical images can be placed next to each other, and then the images can be "stitched" together with panorama software tools (figure 118, see also section 4.4.1).

To maintain a realistic perception of space, "rectilinear" panoramas should be chosen instead of "cylindrical" panoramas so that the picture format appears less extreme. More importantly, vertical and horizontal lines protruding from the image center are rendered in correct perspective. The tradeoff is that a rectilinear panorama is limited to less than 180 degrees. Truthfully, this is usually sufficient. For rectilinear panoramas, it is important to shoot the component pictures with the same camera settings. With SLR cameras, this is best achieved with manual focus and exposure control. If each shot is exposed differently, the border zones will show visible differences in brightness that are extremely difficult to correct. A positive side effect of a rectilinear panorama consisting of multiple shots is the higher resolution of the final image. Especially when the images are to be printed poster-sized, the increase of image data is very welcome.

Figure 119: Architectural image consisting of two shots with different shift settings of the lens [focal length: 35mm]

If the camera is held by hand, it should be twisted around its virtual center of gravity and not from the hips of the photographer. This saves trouble later, especially with close subjects, when the images are fitted together.

A very precise way to expand the viewing angle with multiple images is to use a shift lens. Two images are taken from the exact same position, but with the lens shifted to opposite ends. A montage of the images can be done later on the computer (figure 119, see also section 4.4.2). This works well both in horizontal and vertical directions. The big advantage of this method is the ease with which the images can be stitched; the camera's aim does not change from shot to shot, as it would if the camera were panned or tilted. However, the objects in the image should be as distant as possible, because even the minimal shift of the lens axis has a negative effect on the appearance of objects close to the lens. The consequence is a slight shift of the image elements, which of course complicates the stitching process.

Here is a trick to maximize the image fit: mount the lens on the tripod instead of the camera. Some shift adapters allow this setup with a special attachment. Once this is done, the camera can be moved but the optical axis remains in the same spot (figure 120).

Figure 120: Panoramic shift adapter mounted on a tripod using an L Bracket; camera can be moved horizontally

3.7 Picture Format

The picture’s orientation can make a big difference in the finished architectural photograph. The most commonly used orientation is the wide or horizontal format. This corresponds most closely with the way the human eye perceives the world. The portrait or vertical format is not frequently used in architectural photography, but it is essential to represent a vertical shape.

In contrast to the horizontal and portrait formats, the square format is the calmest because it doesn't emphasize either side (figure 121). The film or sensor determines the aspect ratio, usually 2:3 or 3:4. The photographer then has a choice between portrait and horizontal formats. Cropping afterwards can also create completely different aspect ratios. Extreme or misaligned formats have an immense bearing on how the image is perceived, because unusual dimensions jump right out at the viewer.

Figure 121: Horizontal, portrait and square formats

3.7.1 Extreme Formats and Panoramic Images

A picture’s aspect ratio can be so extreme in either the vertical or the horizontal dimension that one side is a multiple of the other. This is called a panoramic image. It represents an unusual visual sensation for the viewer because it does not match our natural field of vision (figure 122). This “strange“ perception can also influence the way the subject is perceived. For instance, if the height of an image is severely cropped, the spatial proportions appear relatively undistorted and only the narrow format stands out (figure 123). On the other hand, stitched panoramas show extremely wide or high angles of vision.

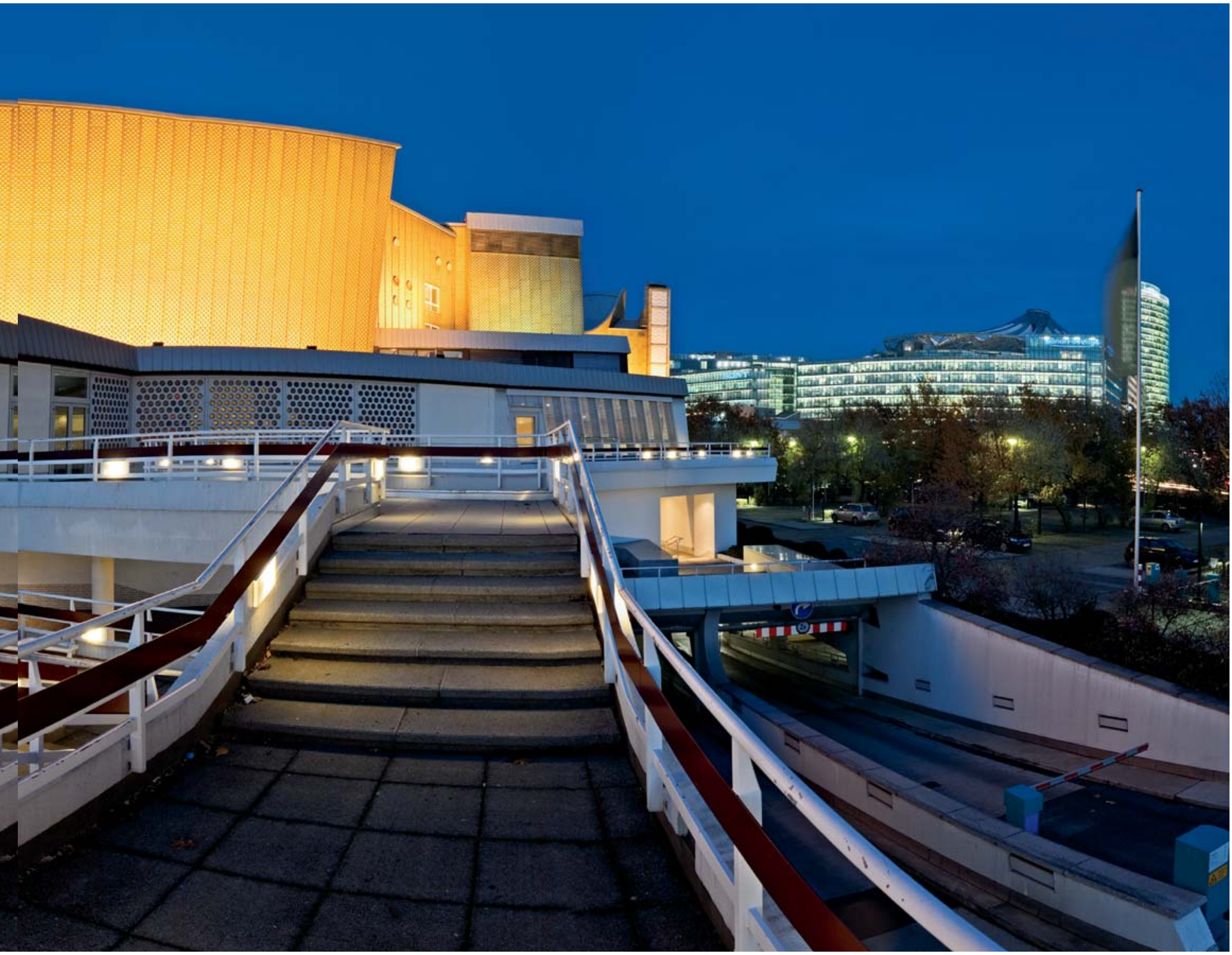
Figure 122: Normal human field of vision: about 170 degrees horizontally and 130 degrees vertically

Figure 123: Image strongly cropped in the vertical dimension

Unlike rectilinear panoramas, cylindrical panoramas curve all level lines that are above or below the horizon (figure 124). Individual images can be stitched to make a full 360-degree image. There are also spherical panoramas that produce a circular image of exactly 360 degrees horizontally and 180 degrees vertically. These images are optimized for viewing on a monitor. It is not possible to compare the impression given by these kinds of images with a super wide-angle lens, but there are reminders of the view one

Figure 124: Cylindrical panorama: lines not at the level of the horizon will be rendered curved

would get from a fisheye lens. The purpose of cylindrical and spherical panoramas is not the correct and authentic representation of an architectural object, but rather an overview based on an extremely wide field of vision. Their proportions and dimensions bear no resemblance to reality. A good panorama is characterized by a suspenseful distribution of its elements. The combined image must have an appealing composition over its entire width and height.



So how is it done? Horizontal, cylindrical panoramas composed from many partial images are best shot from a tripod. If the camera is aimed precisely at the horizon, subsequent problems with converging verticals can be avoided. In order to capture a large vertical angle, it is best to make the shot in portrait orientation using a 90-degree attachment for the tripod head, for example an L-bracket (see figure 37, page 33). Even better is a panorama head that matches the lens and camera. A panorama mounting plate and a spirit level attachment for the camera's hot shoe are other useful accessories that allow a perfectly horizontal orientation over the entire panning range. To achieve an even panorama, all images should be made with the same exposure settings. If the light conditions vary too much, adjustments may be called for. This will result in additional work when the images are stitched, but most panorama software has dissolving functions that smooth the transition from one image to the other.

When each shot is taken, it should be remembered that clouds passing by can create different light and shadow effects. Another problem to contend with is moving objects. Ideally, these should not be located in the transition area between images, where they would definitely be noticeable later when the images are combined. If no tripod is available, the alternative is to shoot from the hand using gridlines, either from an attached grid-type focusing screen or an electronic projection. At the very least, the AF metering zones in the viewfinder can form a provisional guide. Again, it is essential to keep the camera level to the horizon for each shot.

3.7.2 Orientation

All rectangular images have a defined aspect ratio that results in two possible orientations: vertical or horizontal. A building with a wide horizontal expanse is usually photographed horizontally, while a building with domineering height is usually depicted vertically. Typically, the choice of image orientation is a function of architectural shape.

However, the image orientation can be affected if the photographer includes other objects in the building's vicinity. In this case, architecture is no longer the only factor in the format choice. Adding other image elements can lead to a new, dynamic orientation (figure 125).

When the image orientation is deliberately not matched to the image content, tension builds up within the composition. This can completely change the visual impression of a building. The image format may even be contradictory to the architectural orientation (figures 126, 127). In this case, the photographer takes the role of arranger and deliberately emphasizes opposites and relationships. As a result, the photograph's visual expression gains in intensity and the architectural expression becomes subordinate. This is a characteristic of artistically inclined architectural photography.

Figure 125: Additional compositional element (airplane) determines the directional orientation of the image

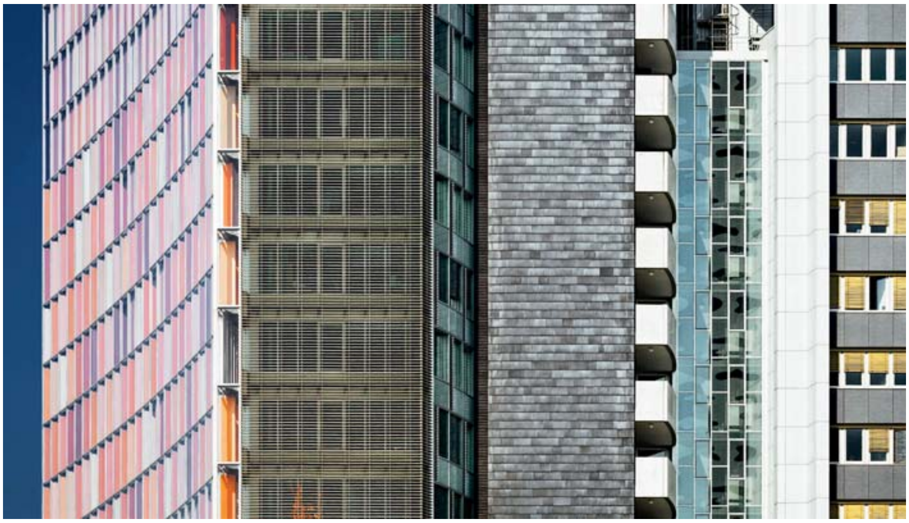


Figure 126: Vertical dimensions and building structure is contrasted by horizontal image format

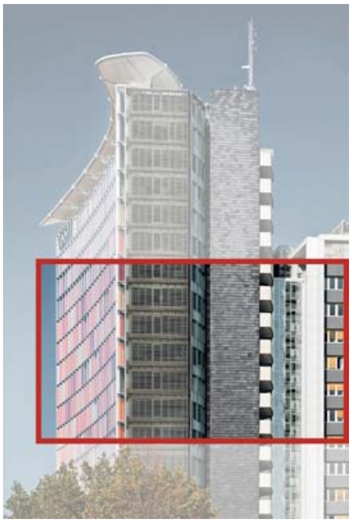


Figure 127: Overview

3.8 Image Frame and Composition

Before pressing the shutter release button, photographers should always think about the desired image frame and composition. Of course, it is possible to make changes with digital image processing software or in the darkroom, but for a good picture the foundation is laid with the exposure. Photographers must contemplate how the synthesis of objects, shapes, edges, and proportions can be turned into a unified, well-thought-out whole. Ideally, viewers will be captivated by an interesting composition, and the structure of the image will follow the lines of the desired visual message. While it is quite possible to show drastic contradictions without interfering with the harmonious overall composition, poor distribution of elements can make even the most impressive building appear dull. In the worst case, the negative appearance of an image becomes identified with the architecture itself.

3.8.1 Composition

There is no recipe for a perfect composition. In general terms, it can be said that a centered placement of the subject almost always brings forth an even, but static composition. This is the kind of presentation preferred by documentary architectural photographers (figure 128). When a building's symmetry needs emphasis, central staging is usually an absolute necessity (section 3.5.4). However, as in other kinds of photography, the traditional central placement is often forsaken in favor of more dynamic and suspenseful arrangements.

Figure 128: Calm, static composition as a result of center placement of the building

Once the main subject is removed from the image center, new possibilities open up. Principles of composition like the golden ratio or the rule of thirds offer recipes for successfully arranged photographs (see page 98). Structuring a picture according to these rules creates visual harmony, while at the same time the photograph appears more dynamic and filled with tension than a centered composition (figure 129).

In some cases, pictures may be more powerful if they break all the rules of photography, aesthetics, and proportion (figure 130). However, such a composition must be done deliberately. Beginners should proceed with caution, since there is a thin line between brilliant execution and miserable failure. Architecture needs plenty of space, both in reality and in a picture. Too much architectural density on one side can throw off the balance and seemingly tip the entire image over.

Figure 129: Suspenseful, dynamic image composition by employing the "the golden ratio"

Figure 130: One-sided composition creating an unusual look

A building does not always have to be shown in its entirety. Parts of the structure that are not essential for the intended message can be placed outside the frame. The façade can be only partially visible and still transmit enough information about the building as a whole. In many instances, the photograph's chosen angles can be more interesting than an overview (figure 131). About such cases, Robert Capa said, "If your pictures aren't good enough, you're not close enough".

The importance of showing emptiness is often neglected in compositions. Empty space plays an important role in architecture, so each photographed building also needs space to breathe. If a photograph is cropped too tightly, the resulting impression is often confined and compressed (figure 132). It is therefore essential to regard empty space as a vital compositional element (figure 133).

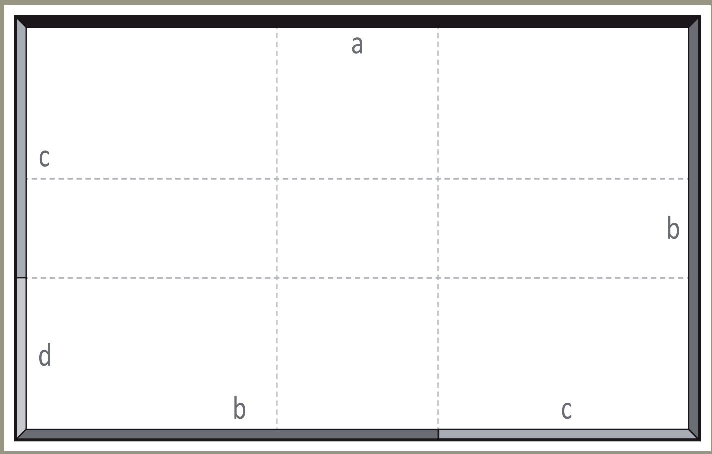
Figure 131: Deliberately chosen viewing angle

Figure 132: Limited perception as a result of an extremely restricted frame

Figure 133: Use of disembodied space

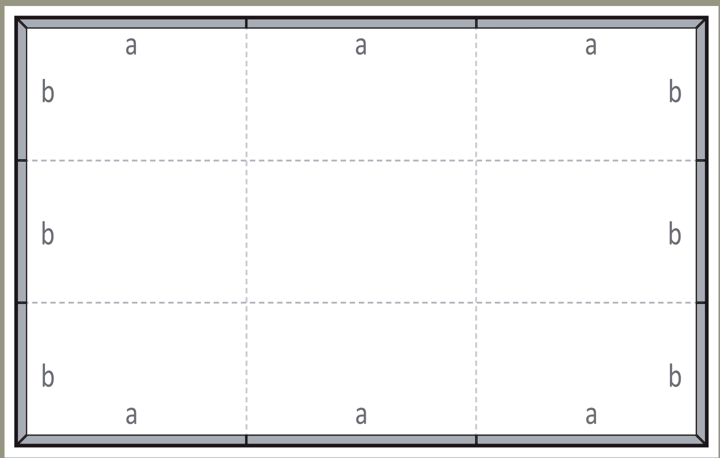
Golden Ratio and Rule of Thirds

The "golden ratio" refers to a distinct proportion (a:b = 1.618). It is widely employed in the arts and in architecture and has been universally recognized as the ideal proportion, as well as the epitome of aesthetics and harmony. Therefore, an image composition in accordance with the golden ratio usually leads to compelling architectural pictures.



a : b = b : c = c : d=1.618

The "rule of thirds" is a similar technique used to achieve compositional harmony. It involves mentally dividing the image into three sections of equal width. If the most significant edges and surfaces of the subject area are arranged on these lines and on their intersections, the result will usually be a balanced, interesting composition.



3.8.2 Image Composition and Environment

Architecture and its environment are intertwined. Objects in the vicinity of a building can influence its appearance as much as the building influences its surroundings. Therefore, it is vital to plan which objects in the building's vicinity are to be included in the image (figure 134). These are comprised of stationary objects such as street lights, signs, trees, and walls as well as moving objects, such as people, vehicles, or even clouds. Involving these elements in a composition can give the viewer more personal, direct access to the building. On the other hand, they can also distract from the building's general appearance.

Figure 134: Objects in the building's vicinity included in the image composition

Figure 135: Clearly structured image composition without distracting environmental elements leads to a utilitarian, impersonal look

Stationery Surrounding Objects

Before each shot, the photographer needs to clarify how the architecture should be photographically presented. A clinically precise look requires a clear, comprehensively structured composition with no distracting objects to obscure the architecture's expression. Such a presentation creates a straightforward impression, but it also is artificial and distant (figure 135). On the other hand, incorporating nearby objects can deliberately enhance the architectural expression. A good example of this is an airport tower, where its form and functionality only becomes evident if it can be seen in the context of the surrounding airport. A bridge is another example; its presentation makes sense only if the space it crosses is also part of the image.

Other than that, objects in the vicinity can enliven the image and provide accents that relate the viewer to the image in a more direct and personal way (figure 136). Such objects can also serve as reference points for the building's spatial dimensions (figure 137). In creative architectural photography, the incorporation of surrounding objects is often employed to illustrate the relationship between the building and its environment (figure 138).

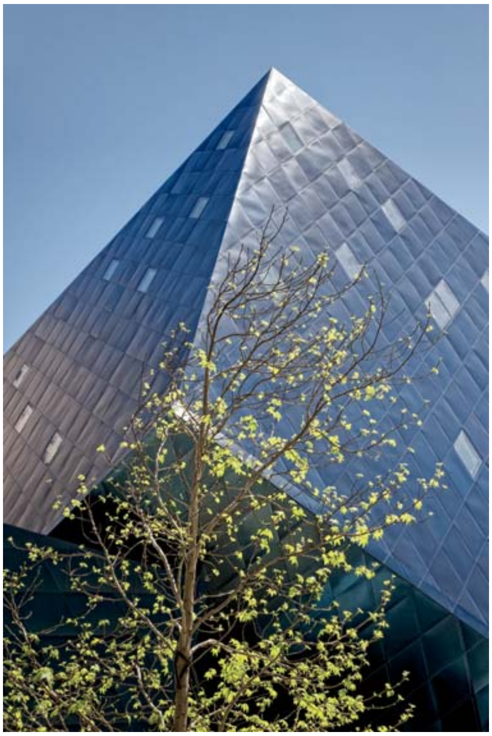


Figure 136: Placing an additional emphasis by incorporating a tree into the image composition

Figure 137: Surrounding objects enliven the composition and convey information about the building's spatial dimensions

Figure 138: The combination of stationary objects and a clearly structured façade adds suspense to the image

Moving Objects

Objects in motion, such as rolling vehicles or walking people, are usually just passing through the subject's surroundings (figure 139). This means that they can either be incorporated or kept out of a shot at will (figures 140, 141).

The topic of whether or not people should be included in architectural photographs has long been a point of contention. With their own dynamic properties, human figures may have a positive or negative effect on a scene. Historically, humans have been kept out of architectural photographs so as not to disturb the building's role as the central point of attention. This is an interesting notion, given the fact that no building has any practical value without human use. But it is also true that human figures can distract from the depicted architecture.

Modern architectural photography is no longer radically sterilized of human presence. In many cases, people are purposefully integrated into a composition in an effort to infuse a sense of movement and dynamic tension (figure 142). Also, human figures can be placed so as to demonstrate spatial relations and dimensions, giving the viewer a more personal point of reference (figure 143). If people are visible in a shot, they should be in close proximity to the building to show the scale and relationship. Human figures in close proximity to the camera will dominate the composition and overpower the building.

Figure 139: Pedestrians passing through the subject's vicinity

Figure 140: Human figures deliberately included in the composition

Figure 141: Human figures deliberately kept out of the composition

Figure 142: Human figures enliven the image, but they also capture the viewer's eyes

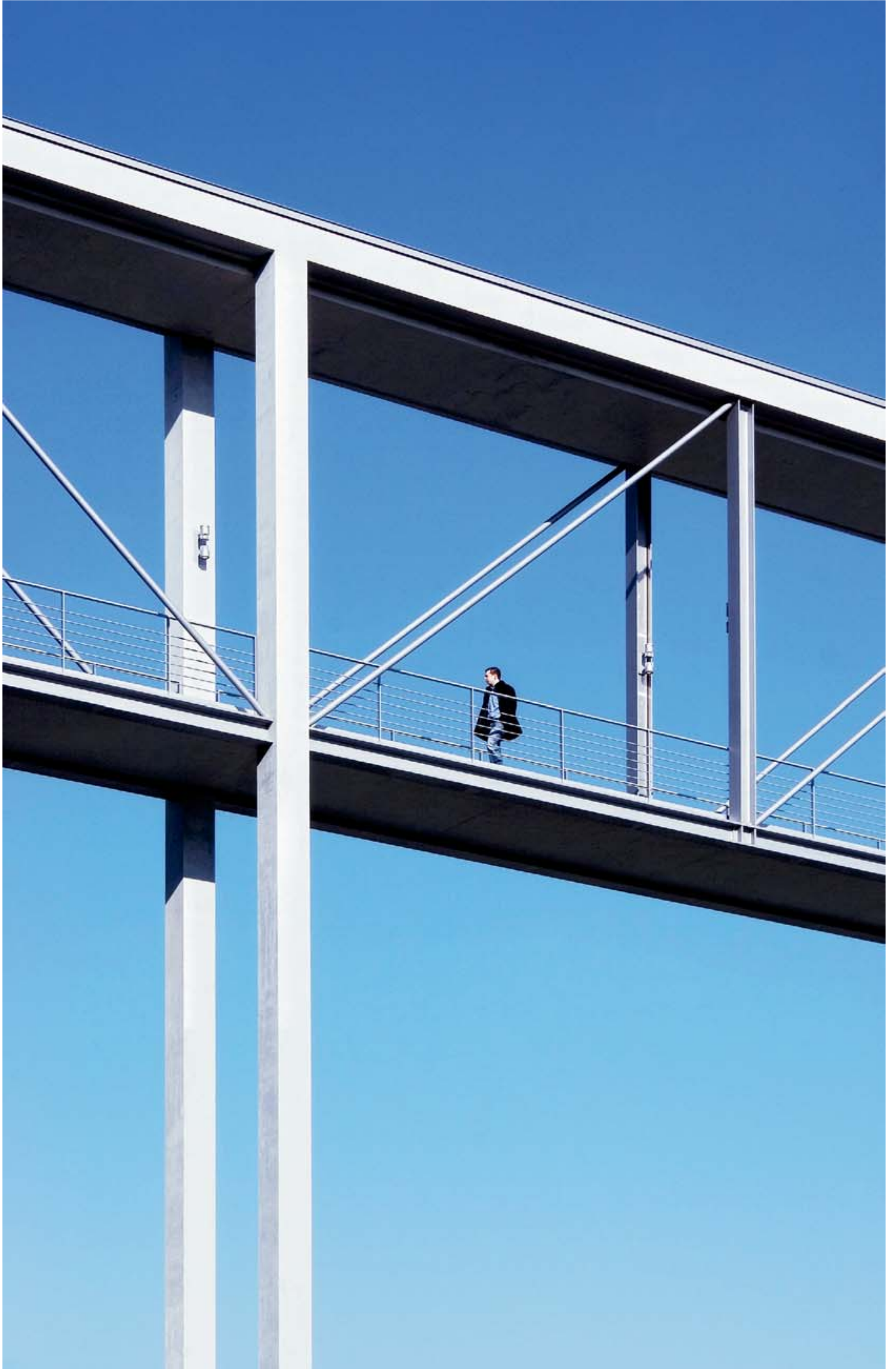


Figure 143: Deliberate inclusion of human figure to illustrate dimensions and spatial proportions

Figure 144: Parked vehicles obstructing the view of this building

Figure 145: A clear view of the same building at a different time

Figure 146: Inclusion of moving objects in an artistic architectural image; [2 sec., f/11, ISO 100, neutral density filter]

When moving objects such as vehicles or clouds are likely to impact a shot, it is best to wait for the perfect moment. Parked cars represent a common problem because they block the view and cannot be moved. In such cases, the photographer is forced to treat the cars as stationery objects and integrate them into the shot. The only other options are changing camera positions or coming back to the location at a different time (figures 144, 145).

Similar to the purposeful inclusion of stationery surrounding objects, the intense integration of moving elements is often employed in artistic architectural photography (figure 146).

3.8.3 Reduced Frame

By choosing a smaller frame and showing only a segment of a building, the photographer can target a specific architectural trait. This can be used to tremendous advantage, since the viewer's attention is not led astray by information about the building's overall shape and dimensions. For example, this technique can illustrate the details of certain building elements (figure 147), or the structure of materials used in a façade (figure 148). Tight framing can therefore direct the viewer's gaze to the intrinsic structure of a building. However, this deemphasizes the building's overall appearance and gives it a more abstract quality (figure 149).

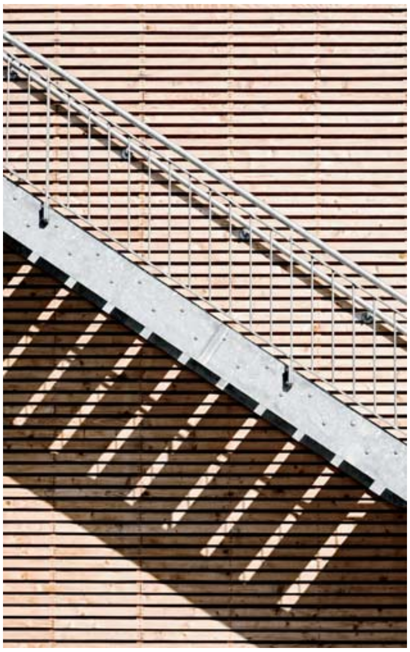


Figure 147: Reduced frame emphasizes shape and detail design of particular components [Focal length: 105 mm]

Figure 148: A reduced image frame emphasizes the special qualities of this building

Figure 149: Internal building structures are being emphasized by the reduced image frame [focal length: 150 mm]

3.9 Shooting Parameters

For each shot, shooting parameters include shutter speed, aperture, and sensor sensitivity setting (ISO value) or film speed. All of these are important for a correct exposure. In architectural photography, extreme experiments are not possible, and for subsequent processing, a precise exposure setting adapted to the light situation is important.

3.9.1 Shutter Speed

Shutter speed is of secondary importance in architectural photography because buildings are stationery objects. In contrast to other kinds of photography, the subject cannot be the cause of motion blur. This makes shutter speed the most flexible parameter, especially if a tripod is used.

At slow shutter speeds, moving elements such as people or vehicles become blurred, but this can be an advantage because it makes the moving objects less dominant and distracting in the composition. Also, the impression of movement in a shot can make it more dynamic. The photographer can show the interaction between architecture and the human element. Streams of people become visible, people standing still become distinct from people moving, and the shot comes alive (figure 150).

If the shutter speed is extremely slow, moving objects may be kept out of a shot altogether. The blur induced by fast motion during the exposure may be so strong that the object is barely perceived in the final image.

Figure 150: Long exposure time makes movement visible; moving and standing people become distinct [2 sec., f/4, ISO 100]

3.9.2 Aperture

In order to avoid poor pictures with inadequate depth of field, the aperture should generally be stopped down to a certain extent. Wide lenses usually have their best focal performance over the entire frame at aperture settings of f/8 to f/11. Fixed focal lenses with a high lens speed may achieve their maximum performance at f/5.6. However, regardless of the focal length of a lens, the maximum depth of field is obtained at the highest aperture value (i.e., the smallest opening).

Care is needed: If the aperture is closed too much, optical blurring may occur as a result of diffraction. This is related to the real aperture diameter and gets stronger under a certain value. In digital cameras, the density of pixels on the sensor is another deciding factor. On a sensor with small pixels, the aperture diffraction occurs earlier, because the circles of confusion caused by diffraction more easily hit surrounding pixels.

The smallest usable aperture without the side effect of diffraction is referred to as “diffraction limit“. For digital cameras with a high pixel density, the diffraction limit would be from about f/8 to f/11. Cameras with larger pixels (usually

Figure 151: Large aperture opening results in narrow depth of field; here, the viewer's eyes are directed to gaps between the stones [focal length: 18 mm, 1/60 sec., f/2.8, ISO 100]

full-frame SLRs) may allow the closing of the aperture under f/11 and up to f/16 without a visible loss of focal clarity.

Every architectural photograph represents a compromise between the greatest possible depth of field and minimal blur caused by diffraction. If all parameters are considered, the ideal aperture for architectural photography is generally between f/8 and f/11. Of course, there are rare cases when it is a good idea to leave this range and use selective focus as a stylistic element. A large aperture can be used to hide specific parts of a building in a blur, while at the same time emphasizing the rest of the building by showing it in clear focus (figure 151). Of course, this method usually results in an unfamiliar representation of the building.

3.9.3 Light Sensitivity

Architectural photography calls for the lowest possible ISO number, whether film or digital technology is used. Film has the finest grain and greatest crispness at low sensitivity. This allows for larger prints and for enlargements of cropped areas. Considering price, availability, and performance, high-quality negative stock with an ISO rating of 100 to 200 is best suited for daily use. More sensitive film should be used only if the grain is intended as a stylistic tool (figure 152). Slide films are less suitable because of their inherent weakness in rendering high contrasts between light and shadow areas.

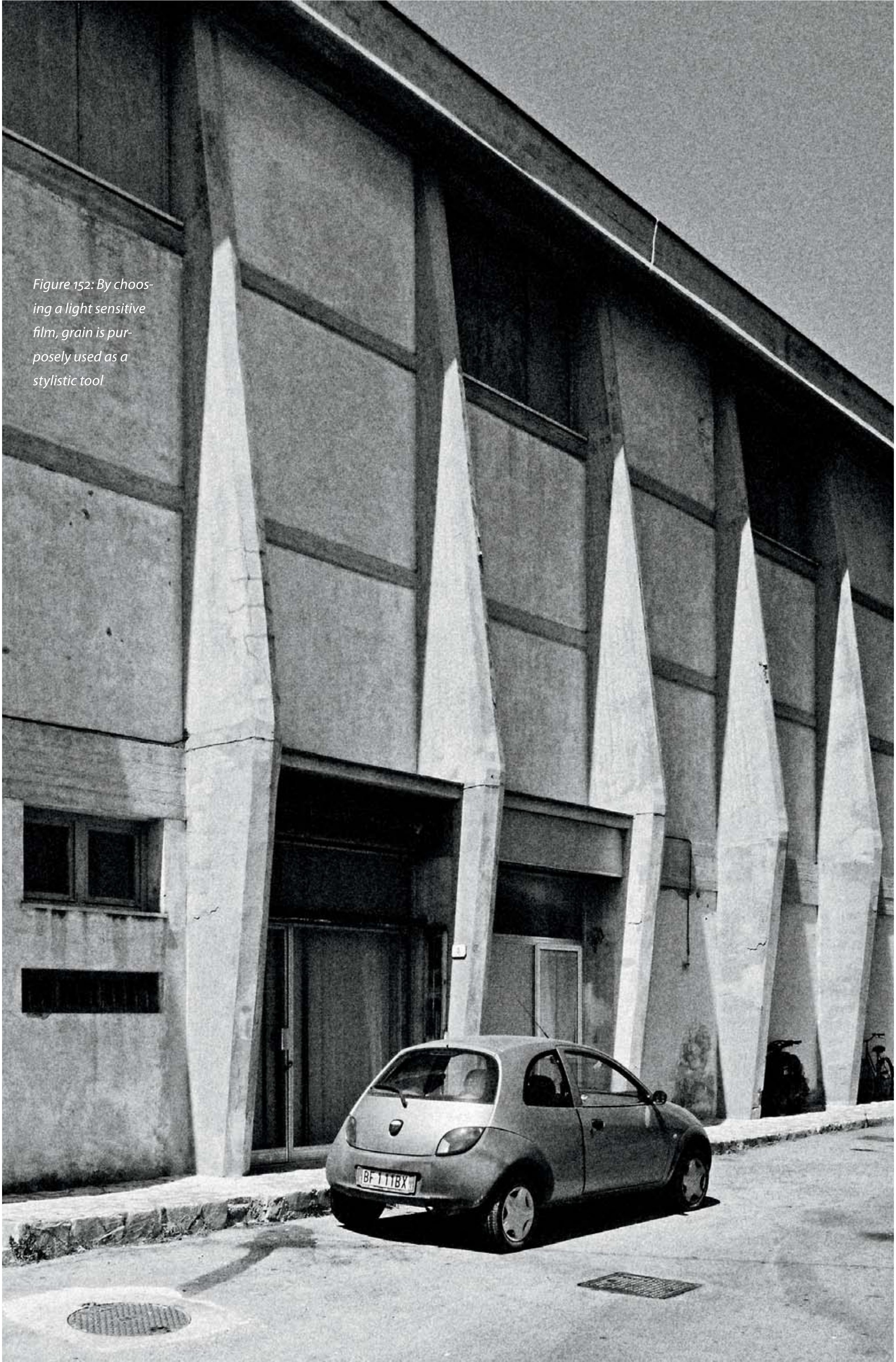


Figure 152: By choosing a light sensitive film, grain is purposely used as a stylistic tool

With digital sensors, lower ISO settings have two advantages: aberrations such as image noise are less of a nuisance, and the largest dynamic range possible can be utilized. This generates more qualitative reserves in case corrections must be made during digital processing. For instance, bright areas may need to be darkened, and vice versa. Some digital cameras have a special setting that puts the ISO value lower than the lowest standard value. The lower light sensitivity is almost always achieved by an electronic trick which leads to no qualitative gain. Rather, the camera intentionally overexposes the image and then electronically reduces it by one step. This process brings with it a reduction of dynamic range, which is why this setting should not be used with contrast-rich subjects. A neutral density filter is a much better tool for making long shutter speeds possible.

Figure 153: The sun behind the photographer's back produces rich contrasts on the façade, whereas the sky area is dark [1/25 sec., f/11, ISO 100]

3.9.4 Exposure

The camera's exposure control system evaluates the ideal combination of shutter speed and aperture, taking the ISO setting into account. Thus, an optimum exposure of the targeted subject is virtually guaranteed. How the subject is evaluated in relation to its surroundings depends on the metering system applied (matrix metering, center-weighted average metering, or spot metering). In architectural photography, an even exposure without drastic peaks or lows is of primary importance. This is usually best achieved with matrix metering or center-weighted average metering settings. In contrast to spot metering, these methods include the entire frame area in the metering process. However, it often becomes necessary to do manual corrections because the camera's electronics can misinterpret light situations. A small, strongly reflecting detail on a building can confuse the camera and lead to an underexposed overall image. With digital cameras, the histogram (see page 113) is much better suited for exposure control than the visual evaluation on the camera display; the small screen does not provide exact color representation, and brightness depends on the viewing angle.

Weather and the camera's position in relation to the sun exert a major influence on the exposure. Completely cloudy skies sharply reduce the contrast, and it is often desirable to enhance the contrast afterwards by extending the histogram. Direct sunlight intensifies the contrast between the brightest and the darkest parts of the picture. If the sun is behind the photographer, it remains relatively simple to produce a correctly exposed image. On the one hand, direct light produces drop shadows that lead to hard contrasts within a façade. On the other hand, it makes the sky appear saturated and intense in color (figure 153). This makes it easier to accomplish an even exposure than shooting against the sun, where the façade is in shadow and therefore poor in contrast (section 3.12.1). The sky, however, appears overexposed, it is washed out and lacking structure as a result of the film's or sensor's limited dynamic range (figure 154). The camera's computer will try to compensate, but this leads to an underexposed façade. This calls for manual correction, yet the contrast differential remains high. It is best to avoid shooting against the sun, but if it can't be avoided, one can shoot an exposure bracketing sequence (section 3.9.5). This allows the photographer to create an HDR or DRI image that captures the extreme range of contrasts (figure 155). In some cases, a graduated neutral density filter (see 3.10) can also help (figure 156).

Figure 154: Shooting against the sun leads to façades poor in contrast in the final image; the sky is overexposed [1/40 sec., f/11, ISO 100]

Figure 155: DRI-Image from a bracket sequence mitigates the problematic light situation when shooting against the sun [1/10 + 1/40 + 1/160 sec., f/11, ISO 100]

Figure 156: Using a graduated neutral density filter in a shot against the sun [1/40 sec., f/11, ISO 100]

3.9.5 Exposure Bracketing for HDR and DRI Images

HDR (High Dynamic Range) and DRI (Dynamic Range Increase) images make it possible to capture subjects with an extremely high range of contrast by combining several shots with different exposure settings (section 4.5). This method can be applied when light conditions produce contrasts too great to be captured by a single shot. In professional architectural photography, HDR or DRI images should not be readily recognizable as such. Their purpose is best limited

Figure 157: HDR-image allows an even exposure across the entire image area

Figure 158: Architectural image with overly applied tone mapping effect

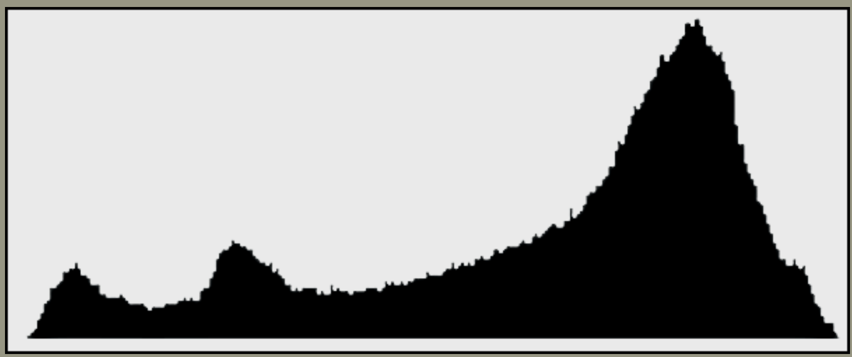
to producing even exposure in all image areas, without over- or underexposed areas (figure 157). When overused, this method produces images that look more like paintings, causing the real message to fade (figure 158).

For HDR and DRI shots, the camera should ideally be mounted on a tripod. This ensures that each frame matches the others. In the next step, the exposure bracketing function is activated and the bracket steps are set to –2/0/+2 or –3/0/+3 EV. These values represent the various exposure compensation settings, i.e., underexposure, normal exposure, and overexposure. The bracket sequence should only be taken in the aperture priority mode. This keeps the aperture at the same set value but varies the shutter speed accordingly.

In order to avoid capturing changes in moving objects such as clouds or trees, it is best to shoot the exposure bracketing sequence in continuous shooting mode. This will expose the shots in the shortest time possible. For night shots, it is a good idea to activate the mirror lock-up to keep mirror vibration from blurring the image.

The Histogram

Histograms are graphical representations of the brightness distribution within an image. The higher the peak in one area of the histogram, the more often this brightness value occurs in the image. A wide histogram indicates that the corresponding image is rich in contrasts; a narrow histogram results from an image poor in contrasts. Primarily used as a gauge to judge exposure, histograms can be found in image processing software such as Photoshop, but can also be displayed on many digital cameras. This makes it possible to evaluate the correctness of the exposure even on very small screens or under bright light conditions. For example, an overexposed picture will be shown with a one-sided peak on the right side of the histogram. Some digital cameras also allow the representation of each color channel, making it possible to analyze each exposure in even more detail.



3.10 Using Lens Filters

Generally speaking, filters are used to create, enhance, or prevent special optical effects (section 2.5.5). Round, adjustable polarizing filters are used to avoid reflections off flat, non-metallic surfaces or to enhance blue skies (figures 159, 160). Graduated neutral density filters make it easier to shoot unevenly lit subjects by darkening specific image areas. By doing so, a more even exposure can be achieved, and over- and underexposed areas can be avoided. However, this is only possible when there are clearly defined, large dark or bright areas (figure 161). Neutral density filters have no influence on colors, but they reduce the amount of light hitting the film or sensor. Depending on the filter's intensity, it can dramatically lengthen the exposure speed and show movement within a composition (figure 162).

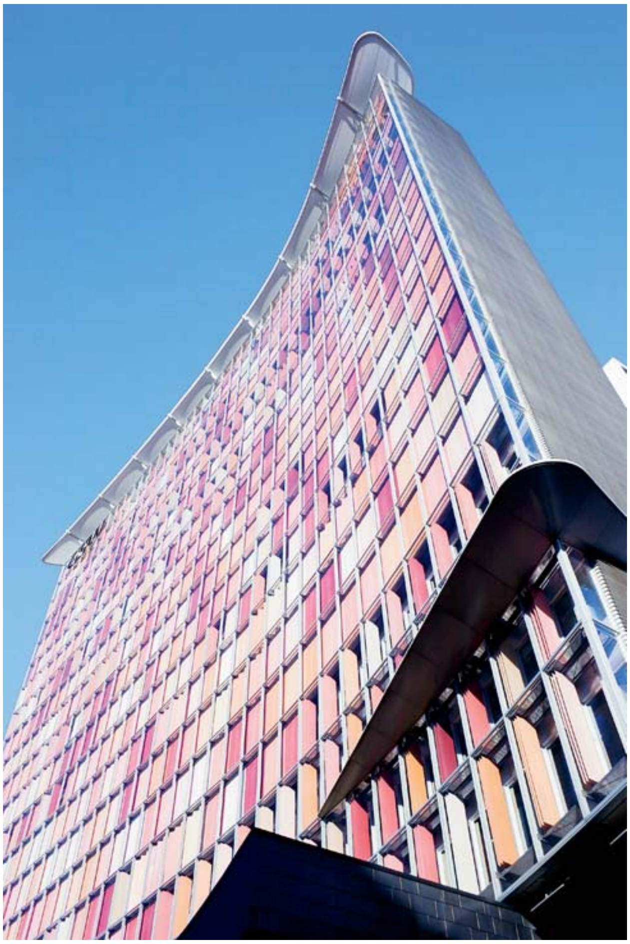


Figure 159: Using a circular polarizing filter, the sky appears naturally bright and the main façade has no reflections

Figure 160: Circular polarizing filter turned by 45° darkened the sky and allowed visible reflections to be seen on the main façade

Figure 161: Images taken without (left) and with (right) a graduated neutral density filter; left: [1/160 sec., f/9, ISO 100]; right: [1/50 sec., f/9, ISO 100]

Figure 162: Using a neutral density filter in daylight to decrease the shutter speed [1/2 sec., f/11, ISO 50]

Figure 163: Interior shot showing body and volume of space, emphasizing the spatial distribution

Figure 164: Interior shot showing the confluence of architecture and interior design

3.11 Photographing Interior Spaces

There are some fundamental differences between interior and exterior architectural photography. In the former, the photographer is in a clearly confined space surrounded by architecture. No information about the building's form, dimensions, or the general appearance can be transmitted. Exterior architectural photography shows an object in space, while interior architectural photography tries to capture an enclosed space and its shape, or a sequence of spaces that are connected through passages (figure 163). In this context, it is interesting to note that some external spaces feel more like internal ones. Consequently, they should be photographed as such. For example, interior courtyards may be completely enclosed on all sides, and if it were not for the missing ceiling, they would have all the characteristics of interior spaces.

3.11.1 Subject

Interior photography does not depict the building as a whole, but rather an isolated interior space. Since the architecture forming the space is complimented by functional or aesthetic decoration, the architecture itself is no longer the central subject. In addition to spatial divisions, decorative elements have equal importance in the composition (figure 164). Rarely does a photographer have the opportunity to shoot interior spaces that are devoid of decorations. That kind of image often seems abstract (figure 165).

Figure 165: Interior shot showing unfurnished interior space

3.11.2 Perspective and Camera Position

Converging verticals present less of a problem with interior shots, because the discrepancy between camera height and ceiling height is not as significant. Compared to exterior shots, interior shots usually contain few relevant objects in the upper half of the image which is why it is easier to work with a level camera position. Nevertheless, it is essential to be mindful of the camera's level orientation or to perform a perspective correction later. Even very slight converging verticals will suggest tilting walls. The procedure when shooting extremely high interior spaces, for example in churches and cathedrals, is similar to shooting exteriors because the huge interior dimensions produce similar problems as, for instance, perspective distortion. When shooting interiors, a photographer is faced with the problem that he does not view his subject from the outside, but instead is standing in the middle of it. This opens the door to new challenges, one being that when shooting from the inside, the choice of viewpoints is much reduced compared to shooting from the outside. In order to maintain a realistic sense of space, the photographer must often stand with his back against a wall or use passageways that allow a greater distance from the subject.

3.11.3 Focal Length

Because confined interior spaces have a small number of possible shooting positions, very wide-angle lenses are particularly suitable for showing a room in its entirety. However, the wide viewing angle resulting from the short focal length, in combination with the short distance between camera and subject, creates the impression of extreme width (figure 166). The architectural space

Figure 166: Extremely short focal length in combination with a short distance between camera and subject leads to extraordinary spatial width [focal length: 14 mm]

will appear unrealistically large, and the spatial proportions of the image will be less realistic as well. This effect is usually tolerated in interior shots, since it actually enhances the architectural impression instead of hurting it. This is in contrast to exterior photography, where the realistic depiction of proportions is usually more important.

3.11.4 Picture Format

For interior shots, the chosen picture format should match the orientation of the space to be photographed. This will produce the most precise rendering of the space (figure 167). In most cases, the photographer does not have an opportunity to incorporate other elements, such as plants or the sky, into the

Figure 167: Orientation of image matches the dominant orientation of the subject and its space

composition so that a different choice of format would make sense. Experiments with formats that are opposed to the room's orientation usually produce unattractive results. For example, a vertical shot of a wide room will result in an unbalanced composition rather than a more dramatic image, because the ceiling and floors (which are mostly irrelevant) will dominate.

3.11.5 Image Frame and Composition

The same principles of harmony apply to both interior and exterior architectural photography. However, the compositional choices are more limited indoors where it is not possible to incorporate environmental objects or the sky. If the frame is narrowed to a small section of a room, the reproduction scale is significantly bigger in comparison to the whole building, and other parts remain invisible outside the frame. Instead, decorative items take on a more important role (figure 168). A careful analysis of the spatial relationships is necessary in order to produce relatively dynamic images. The creative integration of passageways, vistas, and connected spaces can yield extraordinary images (figure 169). In addition, the transitional space between the inside and the outside worlds offers a variety of compositional options (figure 170).

Figure 168: Reduced frame of an interior shot emphasizing decorative objects

Figure 169: Creative integration of passageways, vistas, and connected spaces add suspense to this interior shot

Figure 170: Interior shot showing both interior and exterior spaces

3.11.6 Shooting Parameters

Shooting parameters remain the same for indoor and outdoor architectural photography. But because the interior of a building is usually much darker than the exterior (even with artificial light), longer exposure times call for the use of a tripod. The drastic difference in brightness between indoors and outdoors produces contrasts surpassing the range that can be imaged by digital or analog cameras. Areas of a room may appear too dark while other areas that receive exterior light appear too bright in the final photograph.

There are several options to deal with such situations. The most simple solution is to accept the fact that bright surfaces will be overexposed while the interior space is exposed properly. Another option is to use a flash system to

Figure 171: A flash was used to balance interior and exterior lighting

Figure 172: To preserve the mood of the available light, no flash was used

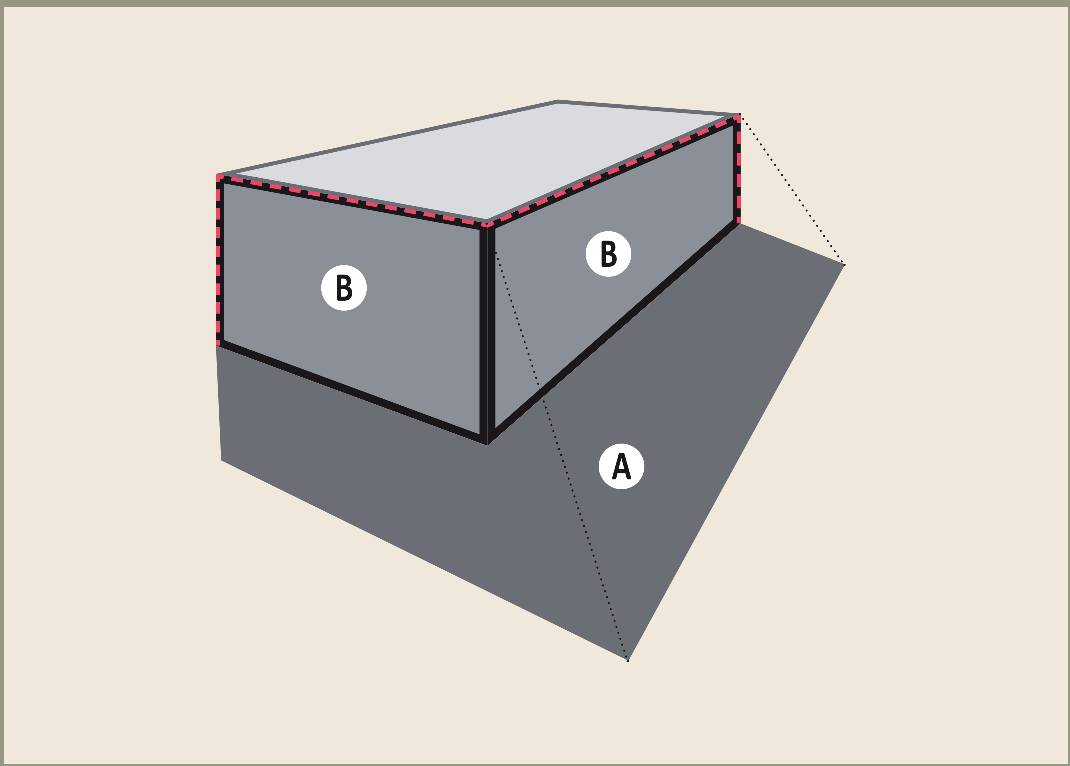
approximate the brightness level of the outside light (figure 171). This demands very powerful flashes with lighting devices like reflectors or soft boxes, which may be beyond the reach of an amateur photographer. In any case, a flash system will alter the customized lighting mood that has been carefully planned by the architect and lighting designer (figure 172). Therefore, exposure bracketings are a good way to deal with contrast-rich interiors. These images can be post-processed as HDR or DRI images and combined into one image with a pleasing and even exposure. However, HDR and DRI effects should be used conservatively in order to produce a realistic representation (figure 173).

Unfortunately, tripods or flash units are not allowed in some buildings. In those cases, the photographer has no other choice but to shoot by hand.

Figure 173: Interior shot with subtle use of the DRI technique

Shadows

In architectural photography, one often deals with various manifestations of shadows. They are usually caused by nearly parallel rays of light coming from the main light source present in almost all architectural photographs: the sun. A cast shadow is the shadow of an object (A) projected onto a surface or other objects. An object will also create its own shadow, which covers the surface facing away from the light source (B). This area is only lit indirectly by reflections coming from the surrounding area. It is interesting to note that the edge of the cast shadow is originated by the edge of the object's own shadow (striped red line).



3.12 Exterior Conditions and Influences

Exterior conditions include all the factors that influence a shot but which can't be altered: shadows and reflections, the weather, the time of day, and the seasons. The quality of architectural photographs is determined by the skill with which the photographer adapts to these conditions.

3.12.1 Shadows and Reflections

Shadows or reflections caused by the sun can enhance the dynamics and aesthetics of a building's representation, but they can also do the opposite. A cast shadow paints silhouettes of buildings and objects on façades, walls, floors, and ceilings, depending on the sun's position. A shadow projection with sharp contours across a façade can distract from the architectural impression, and it makes the correct exposure much more difficult to achieve (figure 174). In some cases, this problem can be solved by using a graduated neutral density filter or by making an HDR or DRI image.

Sometimes the additional structure produced by the cast shadow can enhance a flat or boring surface (figure 175). The shadow thus becomes a compositional element that heightens the dynamic effect of the image (figure 176).

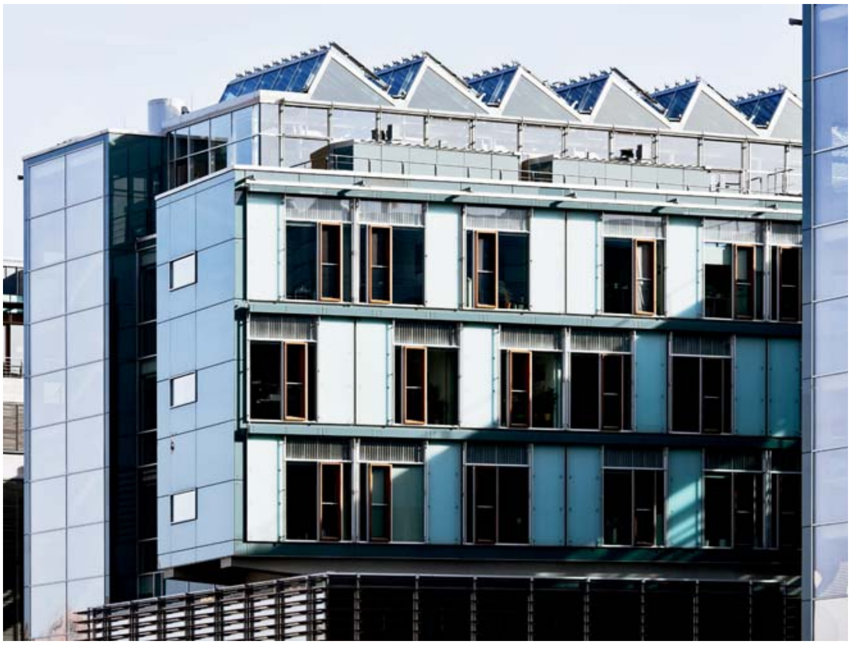


Figure 174: Harsh, cast shadow of an adjacent building makes the correct exposure of this façade very difficult

Figure 175: A cast shadow enhances the image composition

Figure 176: Dynamically cast shadows enliven the architectural depiction

Most problems arise when the sun is low behind the photographer. This can cause shadows cast by the camera, the tripod, or the photographer to show up in the image—usually with a detrimental effect. In such lighting conditions, it is best to position oneself within the shadow cast by a building segment or another object in the vicinity, or to choose a different camera angle altogether (figure 177). Façades that are not flat can also produce short and powerful shadows. Such shadows can become important for the depiction of spaces because they emphasize the architecture's plasticity.

Façades in the building's own shadow have a much smaller range of contrasts. In a comparison, they seem flatter, less dynamic, and more two-dimensional; on the other hand, they bring out structures better. On a directly lit façade, the shadowed areas will often seem completely black, while the lit areas come out unnaturally bright (figure 178).

Reflections can produce effects similar to shadows (figure 179), and they can be a positive or negative factor in an architectural image. The effect will vary depending on the materials used in a façade. For example, the image of another building or surrounding objects can appear in a modern glass façade (figure 180). Such reflections can either emphasize the material or become so dominant that they distract from the building's appearance.

Figure 177: A cleverly chosen camera position neutralizes the shadow cast by the photographer

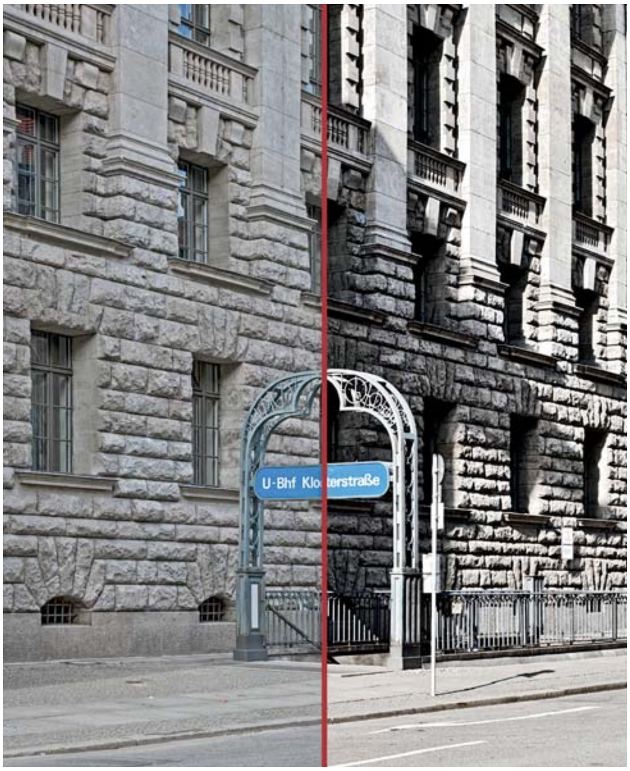


Figure 178: Comparison: façade in its own shadow (left) and directly lit (right)

Figure 179: Beams of light as a result of the specific materials used in a façade

Figure 180: The structure and texture of façade materials in the foreground is creating another (reflected) image

3.12.2 Weather

Weather is a factor that cannot be influenced, but it has a great impact on the way a building is perceived. Direct sunlight from a clear sky produces tremendous contrasts with harsh shadows, intense colors, and three-dimensionality. On sunlit surfaces, the building's materials are represented very clearly, and the various façade elements stand out by color and contrast. Such conditions can produce very aesthetic images and show the building in its best light, so to speak (figure 181).

Figure 181: Direct sunlight creates a three-dimensional, colorful look with clearly visible cast shadows

Figure 182: Cloud cover creates a flatter, less contrasted look with soft shadows

An overcast or cloudy sky yields much less contrast. There are no harsh shadows, and the light is dimmed and diffused. Like giant lampshades, the clouds soften and spread light over a wide area, and the transition from dark to light becomes less intense (figure 182).

The same goes for reflections. Overcast weather renders architecture less punctuated and less three-dimensional. However, depending on the type of building, this may not be a disadvantage. Façades facing north are easier to photograph when the sky is cloudy because shooting into the sun can be avoided or at least reduced (figure 185, page 130).

If the intent is documentation, the photographer should wait for weather that is as generic as possible. In other words, the weather should be typical for the location. An image of a building amid unusual weather does not lend itself to an authentic image. An extreme example would be the depiction of a beach house covered in snow. Then again, this contradiction may enhance the image's artistic qualities. Thus, unusual weather produces unusual moods, attracts the viewer's attention, and makes a picture appear more abstract. During and after a rain shower, water puddles and drops create interesting reflections (figure 183). Snow and fog are other factors that lead to a surreal, but oftentimes suspenseful, presentation of architecture (figure 184).

Figure 183: The weather situation allows a depiction of reflections in a rain puddle

Figure 184: Snow leads to a surreal, suspenseful presentation of architecture

Figure 185: Clouds reduce harsh light and make it easier to photograph a building's north façade

Figure 186: Effects of light and shadows depend on time of day

Figure 187: The light during "blue hour" can greatly enhance a picture's mood [2 sec., f/11, ISO 100]

3.12.3 Time of Day

The time of day can influence an image more than any other exterior condition. If the sky is cloudy, the light differs little between morning and afternoon. But if there is sunshine, dramatically different lighting situations occur throughout the day (figure 186). In the morning, a façade may be in shadow, but in the afternoon it may be in direct sunlight. In addition, the time of day also determines the way environmental objects cast their shadows. Some buildings are wedged among others to the degree that the sun only lights up certain sides at a precise moment. If the photographer is not familiar with the location, it is advisable to research the building and its surroundings on maps and satellite pictures before the shoot takes place.

An extremely potent moment for an architectural image is the "blue hour" (l'heure bleue). This refers to the time between sunset and darkness. Just after the sun has set and the sky is still indirectly lit, artificial light makes an increasing appearance. This special mood shows the sky in intense colors combined with indirect and diffuse light. It is not yet a night shot, and unlit areas are still visible. The effect is caused by the diffusion of light coming from the sun below the horizon. This same effect can also be observed in the early morning (figure 187).

With the onset of night, a reversal of light conditions takes place in and around the building (figure 188). Due to reflections and dark interiors, it is often impossible to see into a building during the day. But at night, the

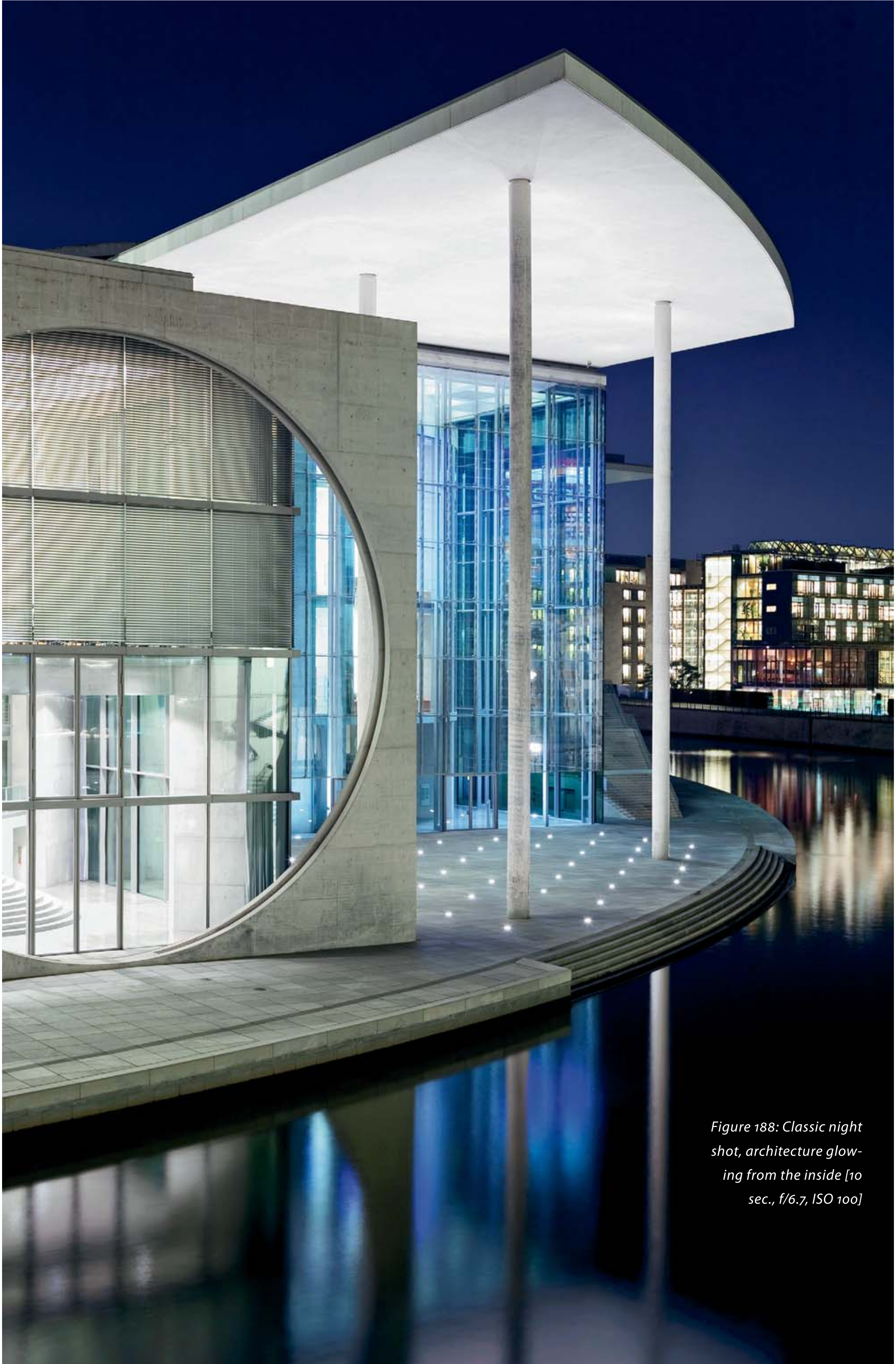


Figure 188: Classic night shot, architecture glowing from the inside [10 sec., f/6.7, ISO 100]

Figure 189: Night shot with slightly used HDR effect [1.5 sec. + 5 sec., f/9, ISO 100]

building radiates from the inside-out. With adequate lighting, it is possible to see parts of the interior. During the day, windows are often the darkest part of the façade, but at night they turn into shining, transparent surfaces. In contrast, unlit areas of the façade now seem dark and devoid of color. Because of the strong differences between light and dark areas, HDR or DRI images may be a good way to precisely document the building's true appearance (figure 189).

3.12.4 Seasons

There is little one can do about the season. The vegetation around a building may undergo significant changes throughout the year. A building may be obscured by foliage in summer, but may present an entirely different, clear view

through naked tree branches in winter. Colorful fall foliage creates a completely different atmosphere compared to the fresh green of spring (figure 190). Of course, this impression is also attached to the architecture. The color ambience of a building and its environment has a direct influence on the way an image is perceived. Cool, blue tones generate a different impression than warm, red tones.

Throughout the year, the sun's path across the sky varies strongly. In winter, the sun remains lower above the horizon, so sunlight tends to come from a lower angle and cast longer shadows. The sun's light travels a greater distance in winter than in summer, therefore diffusion due to atmospheric dust and moisture is increased. Lower winter sun also increases the likelihood of situations where it is necessary to shoot against the sun, which makes exact metering difficult. In summer, the sun climbs much higher in the sky, causing shadows to become shorter. For these reasons, architecture shown in the summer looks less distant and more accentuated than in the winter months (figures 191, 192).

Figure 190:Architectural image showing colorful autumn foliage

Figure 191: Architectural image in late summer at noon: powerful contrasts and colors, high sun angle

Figure 192: Architectural image in the winter at noon: overall cooler look, diffuse light, low sun angle

3.13 Creativity Tips

The following sections offer some ideas for photographing architecture more creatively.

3.13.1 Radical Frames

A skillful composition with radical framing can dramatically alter the building's true appearance. A creative photographer can focus on precisely targeted areas and reduce a building to a very stylized representation (figure 193). In a similar fashion, the photographer can purposefully create images that combine several levels in a single composition, producing an immensely complex impression. In such artful pictures, the various levels merge into an intricate construction of shapes and surfaces where spatial relationships are no longer recognizable (figure 194). An omission of reference points can, in some compositions, cause the viewer to be at a loss when it comes to proportions. Therefore, the image will appear very abstract (figure 195).

These techniques may be used to such a degree that the architecture becomes completely devoid of realism. The building becomes nothing more than an element in a composition of surfaces, and graphic structures or abstract patterns take precedence (figure 196).

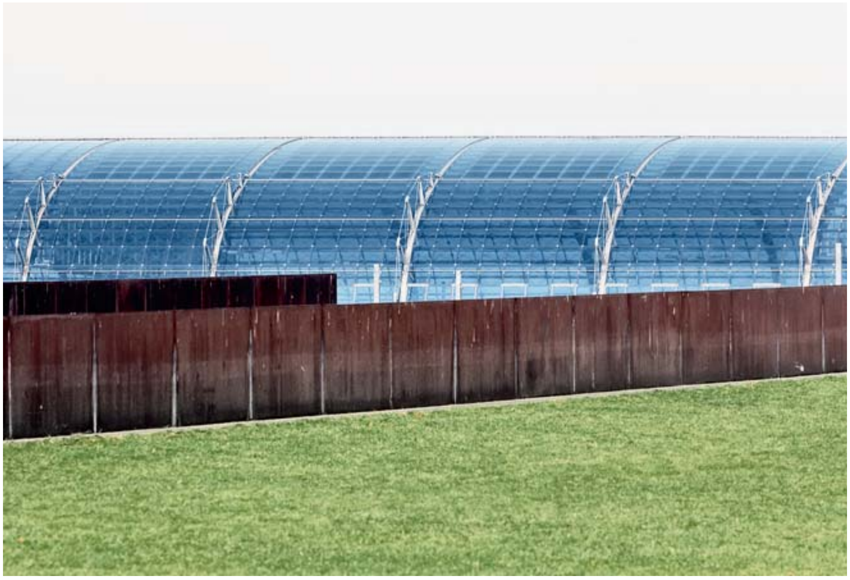


Figure 193: Unusual frame selection emphasizes geometric structures [focal length: 200 mm]

Figure 194: A layered structure of several planes creates an abstract look [focal length: 88 mm]

Figure 195: An image devoid of reference points leads to unclear proportions [focal length: 32 mm]

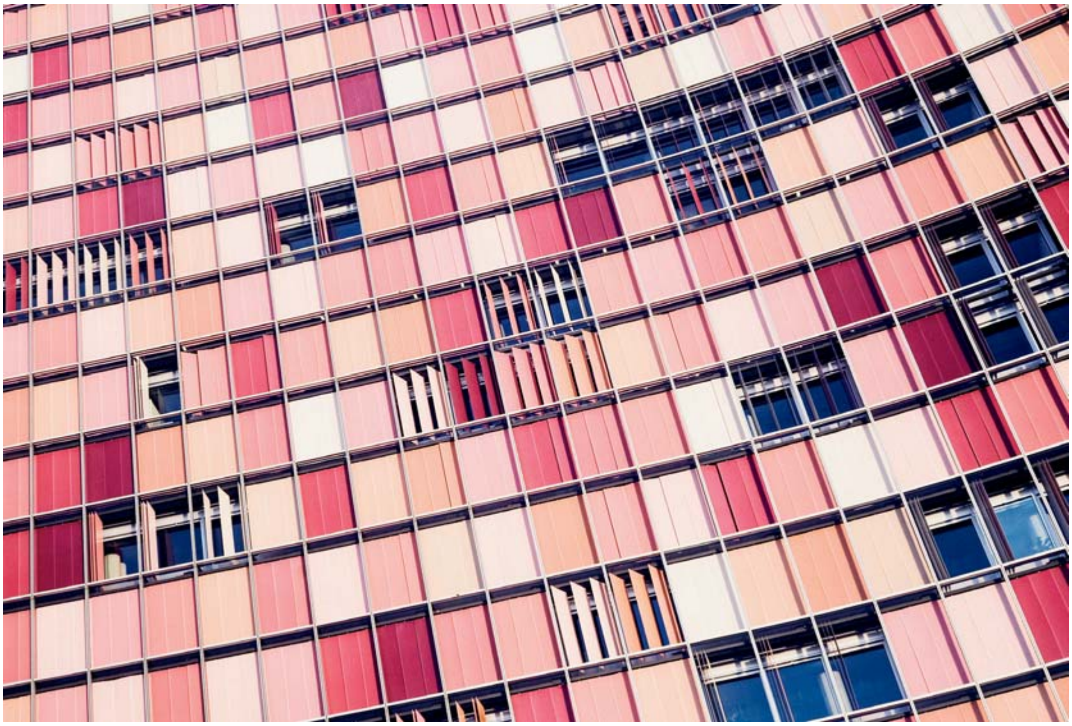


Figure 196: Extremely cropped frame detaches the visual impact from the architecture; patterns and structures become the focal point [focal length: 40 mm]

Figure 197: The unusual vertical view upwards creates a dynamic, yet strange depiction of the architecture [focal length: 17 mm]

Figure 198: A large sky becomes the canvas for these strongly converging highrise buildings in this upward shot [focal length: 14 mm]

3.13.2 Looking Up

Typically, human beings perceive the world horizontally and straight ahead. We rarely lose view of the horizon. Therefore, unusual visual directions, such as straight up, also produce unusual views of architecture. The building's context can no longer be clearly established, and the viewer becomes lost in space (figure 197). Without reference points, the viewer may mistake a ceiling for a wall, and walls for ceilings or floors. The unusual perspective leads to abstraction. Whereas ordinarily the image might feature landscapes, other buildings, or plants, this view may use the sky as a canvas. Because of its even and large surface structure, the sky forms an ideal background for staging the subject. The vertical angle also makes it possible to turn the image in every direction without optically violating the laws of nature (figure 198).

3.13.3 Serial Images

Another possibility for creative architectural photography is to create a series of images. Some images only achieve their maximum effect in combination with others. Such pictures usually show a selected subject as part of a universal theme. Each image in the series may strongly vary in colorization, viewing angle, or material properties, as long as all of them are grounded and tied to the theme (figure 199). The effect of this form of presentation comes from the combination and juxtaposition of the images, which is an indication of artful architectural photography.

Figure 199: A series of images works through the combination of different shots with a common theme

3.13.4 Extreme Reflections

Reflections can have a strong effect, especially on façades where they create a second-level image with independent content. Skillful composition can make use of this effect to infuse symbolism or special meanings. Examples are the depiction of contradictions such as old and new, glass and masonry, and light and heavy (figure 200).

In addition, reflections can be used in such an abstract manner that the depicted spaces can no longer be logically comprehended by the viewer. Through compositional extremism reflections can intermingle sequences, layers, and masses into an entangled web of shapes, colors, and details. In this case, the architecture is reduced to a canvas for a detached visual expression (figure 201).

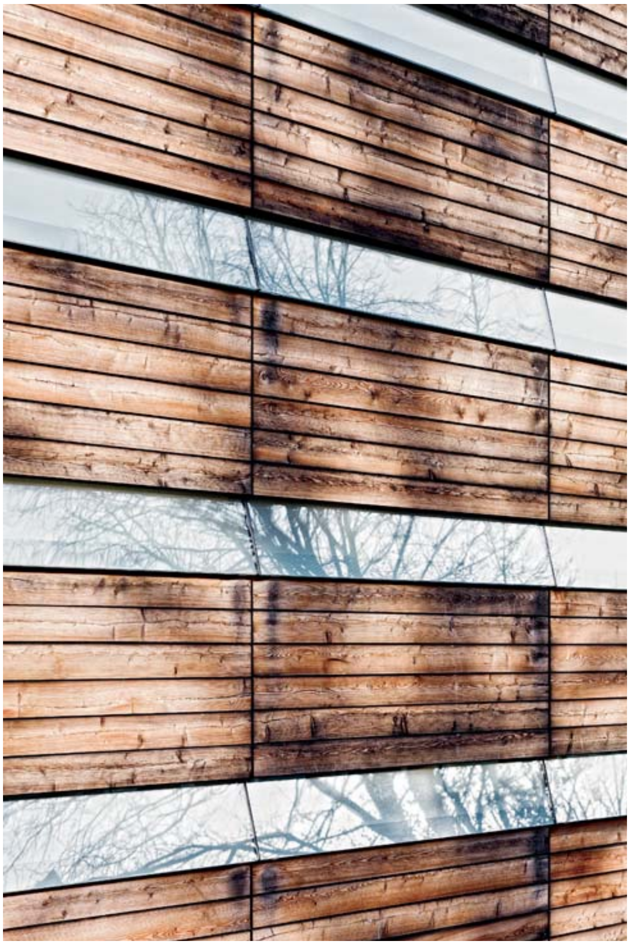


Figure 200: Reflections can have special symbolic qualities: here, wood forms part of the façade, in its original form (tree) but also in applied form (building material)

Figure 201: Unclear spatial relationships caused by mirror effects

3.13.5 Intentional Under- or Overexposure

Another method to show architecture more creatively is the deliberate use of under- or overexposure, which can drastically alter a building's appearance. Underexposure emphasizes the bright parts of a subject by representing its highlights as midtones and its lower tonal values as shadows. This effect radically alters the material appearance of the architecture and makes for a surreal presentation (figure 202). Deliberate overexposure creates the opposite effect. Because all surfaces above a certain level of brightness show up completely white, large, overly lit sections yield an image that appears devoid of frames and limitations (figure 203). Shapes and surfaces become the image's main focus. Such a presentation of architecture is not authentic because shapes and planes dominate the image's message. Deliberately under- or overexposed images often remind the viewer of graphics or computer-generated images.

Figure 202: Special look produced by intentional underexposure

Figure 203: Special look produced by intentional overexposure

3.13.6 Before-and-After Images

Images of a building at various stages of construction are an impressive means to show changes that take place over time. For example, a building can be photographed in different seasons but from the same perspective. This method can also be used to document a building from construction to completion (figure 204), before and after renovation, or before and after a change of use.

Figure 204: Before-and-after depiction catches the viewer's interest

3.14 Solving Problems

HDR images without tripod: Light conditions with immense contrasts may make it necessary to shoot exposure brackets and combine them later into an HRI or DRI image. But what if no tripod is available?

For every HDR or DRI image, multiple, precisely matching frames must be shot with different exposure settings. The slightest difference in framing the base images will lead to problems when the images are combined. So, when shooting HDR or DRI images without a tripod, it is important to keep the framing differences between shots to an absolute minimum. The shorter the distance from the subject, the more problems will result from slightly changed perspectives.

If a tripod is not available, the camera's continuous shooting mode is convenient. In combination with the exposure bracketing function, it allows rapid shooting of several images with different exposure settings, allowing for minimal framing differences even when the camera is hand held. However, it is important to keep the shutter speed for the brightest image as short as possible to avoid camera shake. This technique works only in good light and should be viewed as a provisional solution.

Steady shots without remote control: Ideally, a remote control should be used when making shots from a tripod in poor lighting conditions. This prevents camera shake while activating the shutter release button. However, there are other methods for achieving vibration-free shutter release. The camera's self-timer is one solution. After the appropriate setting is made and the shutter release button is pressed, the photographer's hands can be removed from the camera. After a few seconds, the shutter releases. The obvious advantage is that the camera is not manually disturbed at the time of exposure. In addition, an engaged mirror lockup separates the mirror movement from the opening of the shutter, which prevents vibration caused by the mirror popping up.

Unfortunately, this method makes it impossible to select the perfect moment. Instead, there is a time delay between engaging the release mechanism and the actual exposure. If this will not work in a given situation, there is no alternative but to release by hand. This rarely presents a problem during the day, but may at night or twilight. Camera shake can be somewhat reduced by using the other hand to support the wrist of the release hand.

Avoiding blurred images: In poor weather, shutter speeds may become so long that stable, sharp shots cannot be accomplished by hand. The longest exposure time that can safely be done by hand can be calculated with the following formula:

1 : (focal length x crop factor) = longest exposure time in seconds

For example: To achieve a sharp handheld shot with a Four-Thirds camera (crop factor 2) and a focal length of 200 mm, the longest exposure time would be 1 : 200 x 2 = 1/400 second. It should be noted that this rule of thumb was devised when all cameras were analog, and with small prints in mind. For larger prints or digital cameras with very small pixels, blurring can become a problem much sooner. To be on the safe side, a faster shutter speed should be set. Many modern SLR cameras and lenses incorporate image stabilizers that further reduce blurring, but even these technical gadgets have limitations.

With modern digital cameras, it is a good idea to select a higher light sensitivity setting. Setting a higher ISO value should be the first countermeasure against possible blurring through camera shake. Even so, the highest ISO values should only be set in emergencies, because these settings increase image noise drastically while decreasing the possible dynamic range. Also, accidental underexposure is to be avoided.

Although opening the aperture can reduce blurring, opening the lens all the way is rarely recommended in architectural photography—especially with lenses of less than stellar optical quality. The maximum aperture brings out optical aberrations to a higher degree. Therefore, opening the lens all the way only makes sense in case of an emergency and when the ISO setting is already maximized. A correctly exposed image (and this is important!) taken with a high ISO value usually looks much better than an image with blurring around the edges, chromatic aberrations, vignetting, or poor depth of field.

In addition, there are several other ways to avoid blurring. One of the most effective ways is to use a provisional "tripod" or mount on location—walls, railings, or protruding edges, even tables, chairs, or vehicles. To avoid scratching the camera or the surfaces, a piece of cloth or similar insulation can be used. Another useful item is a so called bean pod. This is a bag with a leather or cloth cover half filled with dried beans. This not only makes a relatively soft work platform, but also allows slight camera alignments while insulating the camera from vibrations. If no flat surface can be found, a wall can be utilized. This works best when the camera is used in portrait orientation and pressed against the wall while a finger or small object is held between the front of the lens and the wall for keeping distance.

An old method of avoiding camera shake uses a simple cord with no elasticity. One end of the cord is tied to the camera housing, and the other into a loop through which the photographer's places his foot. The cord should be just long enough so that when it is kept under tension, the camera ends up in the usual shooting position at eye level. This simple but effective method stabilizes the camera and cuts down on noticeable camera shake.

If none of the options mentioned above are available, there is nothing to rely on but a steady hand. It is always a good idea to lean against a wall or any stable object, because this at least stabilizes the torso. With breath control, the shutter should be released at the low exhalation point after breathing out slowly. If lighting conditions are poor, it is always best to shoot several exposures so that the image with the least amount of blurring can be chosen later.

Commentary by Marcus Bredt

Architectural Photographer

About architectural photography

First of all, architecture is a rewarding subject for photography. Buildings stand still, they do not need to be directed, and they are available both day and night. Upon first glance, it might seem that selecting how to depict a building is a simple choice. But an architectural photographer is challenged with showing an ordinary, everyday building in such a way that its shapes and structures appear fresh and interesting.

We may pass an office building daily without noticing anything special about it. We may use a railroad station for the usual reasons. Manufacturing facilities and warehouses do not raise expectations of artistic value. In all of these cases, the architectural photographer's objective is to show those things that would ordinarily go unnoticed. This may happen by emphasizing a geometric shape so that the reduction to the essential brings out its own aesthetic beauty—something that may have been hidden before. It is possible to incorporate simple details into an image so that a seemingly barren subject takes on a new quality. Yet in the quest to make an image more interesting, it becomes important to avoid too many effects or to distract from the actual subject (figure 205).

About the first steps as an architectural photographer

Of course, it is fun to try out and practice new effects. This is a normal process when trying to find one's own style. Early on, technical expertise and finesse may take the front seat. But then again, the subject is even more important—a great building usually also leads to a great picture. For this reason, my first assignments for the architect Libeskind were lucky breaks. The spectacular architecture was perfectly suited for me to seek technical perfection, explore lighting, change the viewing position, and try out frontal views against diagonal shots. Still, there is a difference between my pictures from back then and my pictures today. Becoming an architectural photographer is a slow process; one that eventually leads to a personal signature. Technique is important, but it certainly is not everything. There is a great deal of instinct and intuition involved as well.

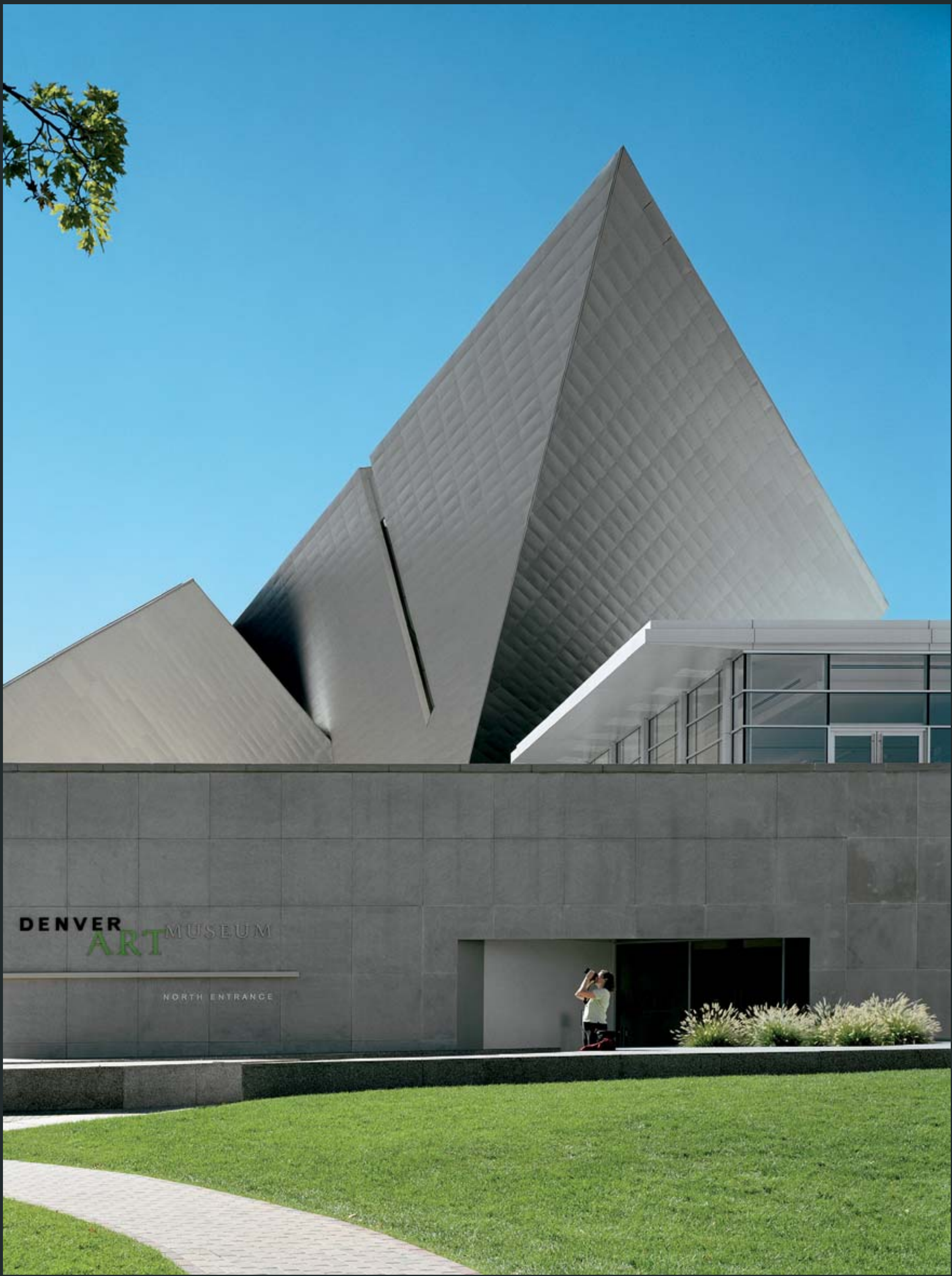


Figure 205: Denver Art Museum; Photograph: Marcus Bredt

About the profession of architectural photography

These days, it often happens that the subject comes to me, and not the other way around. Of course, much of my work is assigned. But even with contract work, there are a great variety of possibilities such as perspectives, light conditions, post-processing, and coincidences. Architectural photography is more than the mere depiction of a building, and a building is more than an assemblage of materials. One learns to perceive a building in a holistic, all-inclusive way when technical questions are no longer the main concern and one concentrates on the diverse aspects of the building. This does not only involve seeing, but also hearing, tasting, and smelling. When I look at a building, is it less important that I capture the building with my eyes. Rather, the building grips me and draws me into a dialog with it. The building is not just an object in front of me. Not until I work with a building, I can turn it into the image I have in mind. This also involves the weather, the surroundings, the functionality—in short, life itself becomes part of the image.

For me it is especially important to point out that we do not just live in our environment, but with it. Just as we have an influence on natural processes, urban development, and people with whom we interact, these influence us in return so that there is a steady field of mutually applied tension (figure 206). Architecture is not only a static edifice. Ideally, it can join art and functionality, natural and constructed environments. It manifests the ongoing communication between man and material, between technology and nature. Capturing this dialogue momentarily, and making its liveliness visible, is always a novel experience for me. Even the most subtle force from inside or outside can change the entire ensemble. The fleetingness of a moment consisting of past and present, stasis and dynamism, observation and experience, is collected at once by pushing the shutter release button (figure 207). Capturing this moment, while becoming one with the environment and the image, is the real payback in searching for the perfect effect.

The most important partners of the photographer are light and weather. A building in front of a gleaming blue sky is nice, but usually rather boring and too rich in contrast. Clouds, precipitation, and fog have more to offer and create a suspenseful mood (figure 208).

Architecture can be documented, but it can also tell stories. I love to tell little tales with my work. Again, it is important that the narrative does not supersede the subject, but rather enhance it. These images speak in a variety of ways. There are fast sequences of action, slow observations of details, romantic moments, and even fleeting humor. Sometimes there are contradictory scenes in which place and story do not match, color contrasts blur things out, or nature appears in bizarre juxtaposition to technology. Such shots invoke a special effect and fascination in the viewer (figures 209, 210).

Figure 206: Denver Art Museum; Photograph: Marcus Bredt

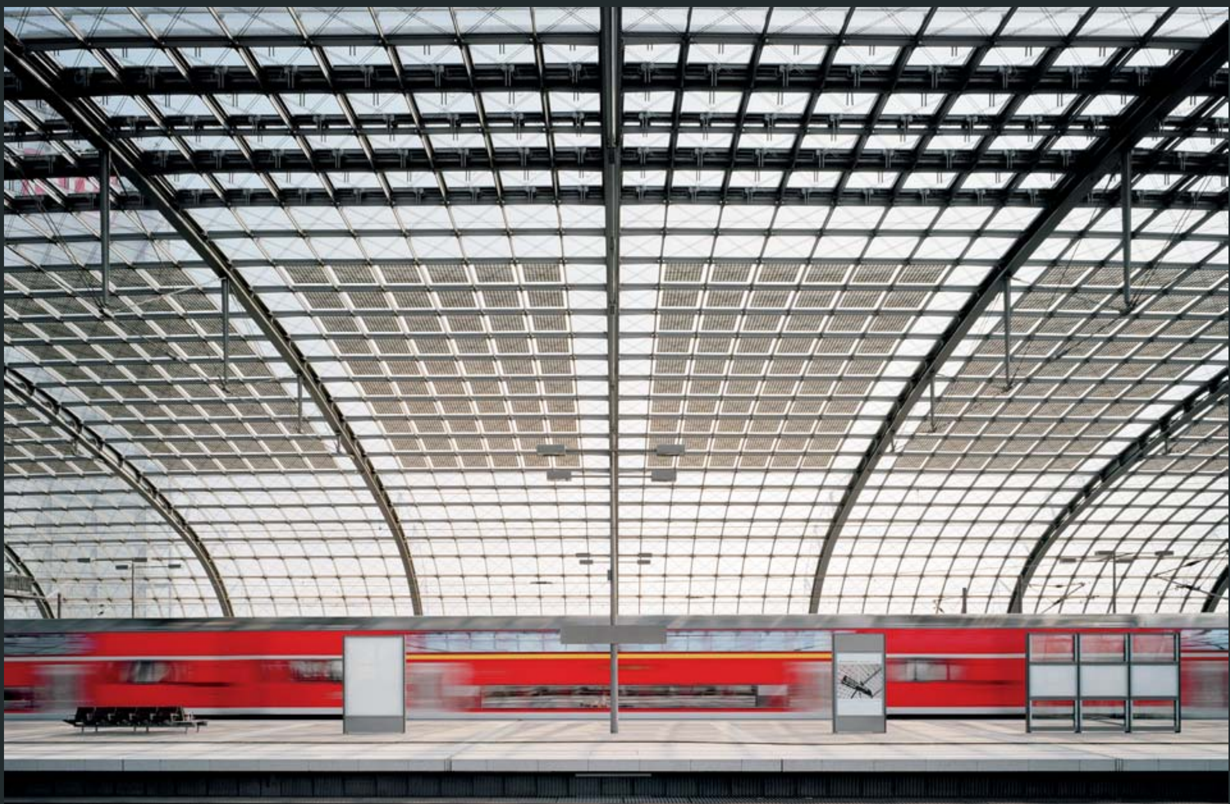


Figure 207: Berlin Main Railway Station, Germany; Photograph: Marcus Bredt

Figure 208: Olympic Stadium, Berlin, Germany; Photograph: Marcus Bredt

Vita

Marcus Bredt was born in 1968 in Göttingen, Germany. He has worked as a photographer in Berlin, Germany, since 1992. After training at the Lette-Verein Berlin, he and a colleague founded the firm BitterBredt-Fotografie. Since 2001, he has worked worldwide by himself under the name Bredt-Fotografie. His clients include architects such as Studio Libeskind, gmp Architekten, and Sauerbruch Hutton Architekten, as well as magazines and various institutes such as the Museumsverbund Gerhart Hauptmann.

Figure 209: Contemporary Jewish Museum of San Francisco; Photograph: Marcus Bredt

Figure 210: Detail; Photograph: Marcus Bredt

4 Post-Processing Techniques

This chapter illustrates post-processing techniques for use after the shoot has taken place. For analog cameras, the film must first be chemically developed and then scanned to produce digital images. Professional scanners achieve significantly better results than more affordable film and flatbed scanners with backlit modules hooked up to a computer. After digitizing, the images can then be manipulated on the computer without further restrictions.

For digital cameras, the extra steps of developing and digitizing can be omitted. The image data can simply be transferred to a computer via a connection cable or a memory card reader. The advantage is that not only the JPEG or TIFF images can be transferred to the computer, but also the "digital negatives" or RAW files, which give many more options for post-processing.

4.1 Digital Image Formats

4.1.1 What is RAW Format?

RAW format is a data format specific to each camera manufacturer as well as to camera models. RAW files are written on a memory card with barely any processing through the camera's software. To process the image on the computer, a RAW converter is necessary. This software offers fundamental processing options and also transforms the files into cross-platform formats, such as TIFF or JPEG, that can be opened by all image processing software.

4.1.2 Difference Between RAW and JPEG Formats

Unlike JPEG format, RAW format allows degradation-free storage of data coming from the image sensor. Parameters such as white balance, noise reduction, color saturation, contrast, and sharpness do not alter this data set, which is why these parameters can be applied later without compromising image quality. Only exposure settings such as shutter speed, aperture, and ISO are not variable.

When JPEG format is used, the data file is processed immediately after the shot and before storage. While Bayer interpolation replaces missing color values with information from neighboring pixels (see page 16), the subsequent in-camera workflow includes image optimization steps like adjustment of internal sharpness and contrast, color depth reduction, and data compression (figure 211). Changing these parameters later is possible with additional steps in an image-processing program, but keep in mind that since the data is no longer original, there will be some loss of quality.

4.1.3 Advantages of RAW Format

RAW format's advantages begin at the time of shooting because the photographer has fewer parameters to consider. For example, it is no longer necessary to choose the correct white balance setting on location, because this can be done later and more precisely during the RAW conversion process. As a result, the photographer has more time to concentrate on composition and exposure.

One of the biggest advantages of RAW format is the possibility of lossless processing. All settings on the RAW converter can be undone without hassle or loss of quality. This is because all user-specific data are stored in a small "changes" file while the original RAW data are not altered. Theoretically, one could access the RAW data after many years and still make adjustments and changes without data loss.

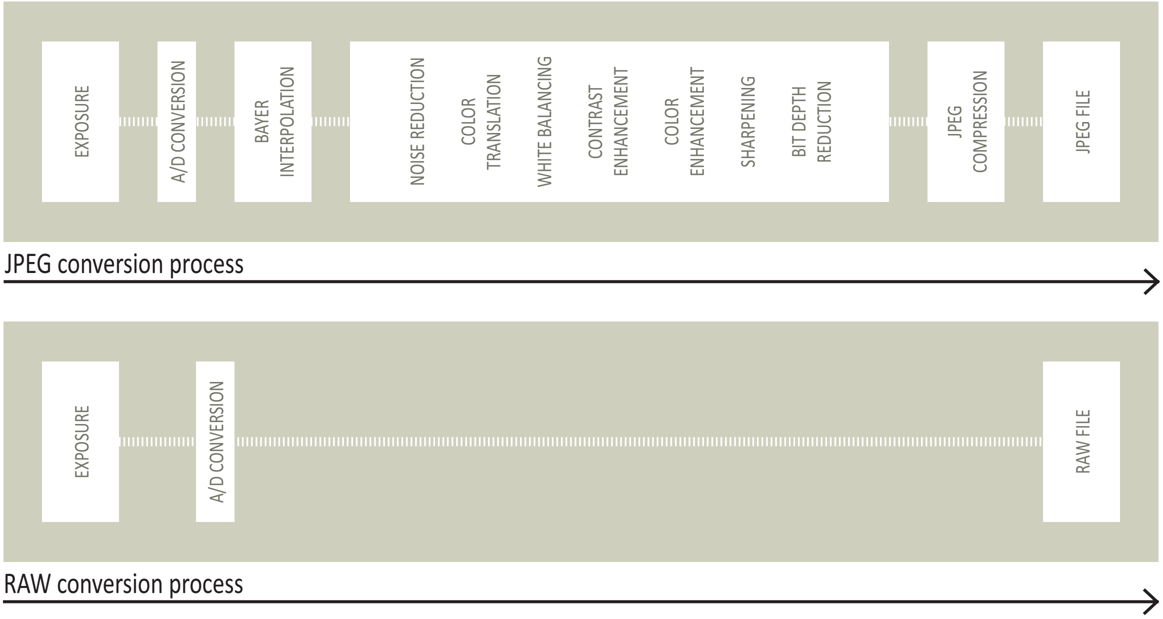


Figure 211: Processing: from exposure to data file

Another point is that RAW format offers the highest image quality in combination with the most flexibility for processing. RAW converters on the computer are far superior to the algorithms integrated into the camera's software. Hence, the processing power of modern computers can perform more elaborate interpolations, achieve better color values, and deliver more performance and quality reserves than the camera's own electronics. Therefore, it is not surprising that RAW data conversion on the computer results in better images (figure 212).

Compared to JPEG files, RAW files incorporate the maximum range of image information. This is the best foundation for correcting mistakes that happen on a shoot. JPEG format has a color depth of 8 bits per color channel, which means that only 256 levels can be shown. By comparison, RAW format allows 12 or even 14 bits per color channel, which translates into 4,096 shades or 16,384 shades! When intensive post-processing takes place, the inferior color depth of a JPEG image is immediately apparent; areas with smooth transitions of color and brightness (for example, a clear sky) produce visibly harsh gaps and levels.

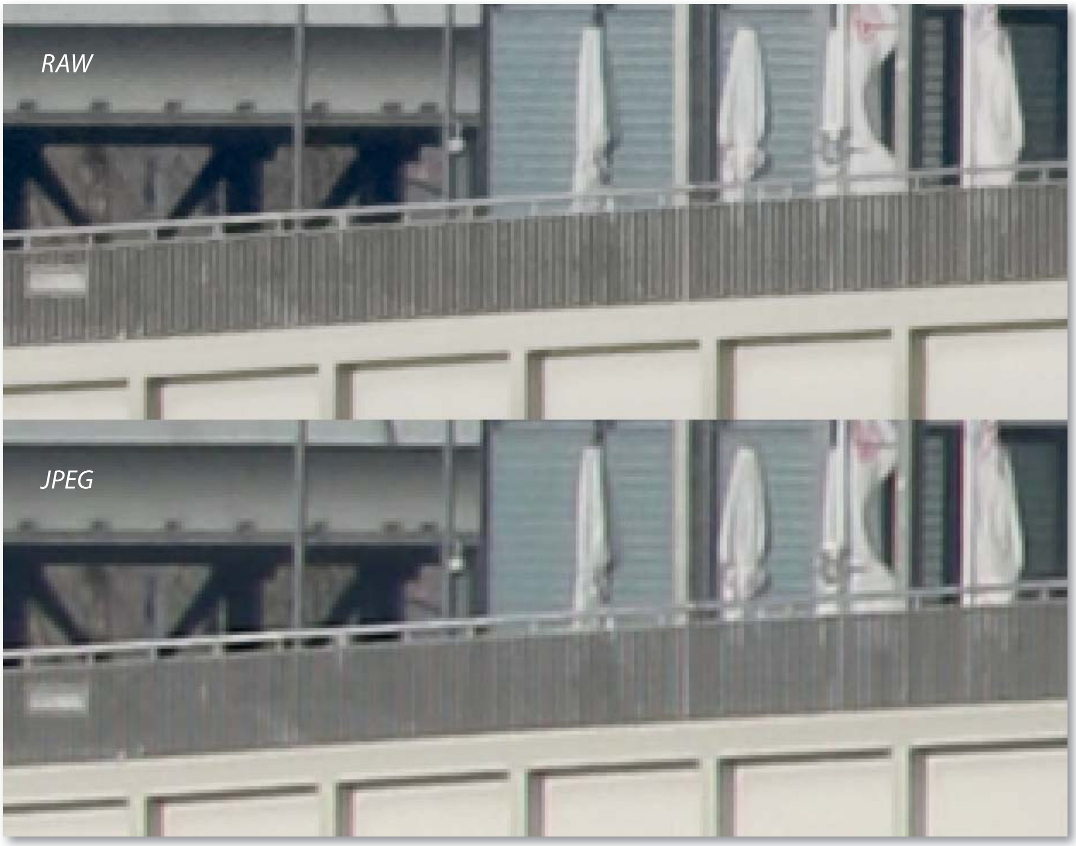


Figure 212: Image quality of RAW and JPEG formats (strongly enlarged detail)

The much finer gradation of a RAW image allows plenty of room for post-shoot exposure correction. Brightness information is retained to a much higher degree in RAW files as compared to JPEGs. It is not surprising that while working on under- or overexposed images, more image information can be retrieved from a RAW data set than from an already lossy JPEG.

Another positive aspect of RAW format becomes apparent when image errors caused by the lens must be corrected. Many RAW converters allow for a nearly perfect correction of vignetting and chromatic aberrations. The results are often much better than with other software solutions applied after the conversion to JPEG or TIFF has already taken place.

White balance is used to match the camera with the color temperature of the predominant light. To achieve perfect white balance on location, a white (or gray) scale card is necessary. Furthermore, the camera's LCD display is not an accurate gauge to begin with. Therefore, the manual white balance tool in the RAW conversion software is an enormous help. As long as RAW files are processed, white balance is lossless and can be undone without problems.

Many cameras utilize internal noise suppression technology for converting and optimizing images, especially with high ISO settings. This process usually comes at the expense of small image details; JPEG files may look as though they had been ironed flat. Here lies another advantage of RAW data. The noise will seem stronger if the image is displayed in the RAW converter software because it has not yet been suppressed. However, suppression by the RAW converter or by other noise reduction utilities usually yields superior results, because it has more options to address the noise type of each individual image.

When using RAW format, the photographer does not have to define a specific format or color space right from the start. RAW format allows a delay of this decision up to the point when all settings are made in the RAW converter.

4.1.4 Disadvantages of RAW Format

In spite of all its advantages, RAW format also has a few negative sides. RAW data files are much larger than JPEG equivalents of the same resolution, so writing RAW files onto a memory card takes longer and uses more space. Moreover, RAW format is more demanding on computer hardware because functions like conversion and preview take a lot of processing power. This drags down the work tempo because every step takes longer. Without appropriate conversion, RAW files are not suitable for a quick look or processing of images. Another hassle is that the various RAW converters must be customized for each camera model. Software updates often become necessary to make the converter compatible with a new camera.

4.1.5 Conclusion

When the advantages and disadvantages of RAW files are compared, it becomes clear that the use of RAW format represents an enormous advantage for architectural photography. The advantages associated with image quality, flexibility, and post-processing alone are enough to recommend the use of RAW format without restrictions.

Ideal Computer Hardware

In particular, two computer components will affect the speed of image processing: the processor (CPU) and Random Access Memory (RAM). By comparison, the requirements placed on the other computer components are less important. A fast processor, ideally with two or more cores, will ensure speedy processing of files when applying tools such as filters and so on. The larger the data files, the more important RAM capacity becomes. If the RAM space is filled up during processing, programs such as Photoshop will move data to the much slower hard disk. This can cause serious delays in the workflow. A RAM size of 4 GB and more seems like a good investment for serious photographers. However, with RAM of this size you should take care not to use 32-bit operating systems, because these usually max out at 4 GB of RAM. It is better to upgrade to a 64-bit system.

A good monitor is essential for digital image processing. Today, flat LCD screens have almost completely replaced cathode ray tube (CRT) monitors. When it comes to contrasts, color rendering, and display quality when viewed at an angle, the quality of the integrated LCD panel is the deciding factor. As is often the case, you usually get what you pay for. Screen calibration devices are highly recommended, as they guarantee a good rendering of colors when using software that supports active color management.

4.2 RAW Conversion

The following section explains the steps needed for a typical RAW conversion of an architectural photo. The software used in this example is Adobe Camera Raw (ACR Converter). It forms an important part of Adobe Photoshop and Adobe Photoshop Elements, and it shares many similarities and settings with Adobe Photoshop Lightroom.

4.2.1 Workflow

1. Image analysis: This image shows the Reichstag Building and a small part of the Paul-Löbe-House (on the right) in Berlin, Germany. The picture was taken from the opposite riverbank under slightly diffused light conditions. A wide-angle shift lens was used, which shows the building for the most part without converging verticals. The lighting is even, and there are no extremely overexposed or underexposed surfaces. The adjustment sliders of the RAW converter are at their standard settings. Only the white balance was automatically imported from the camera's settings (figure 213).

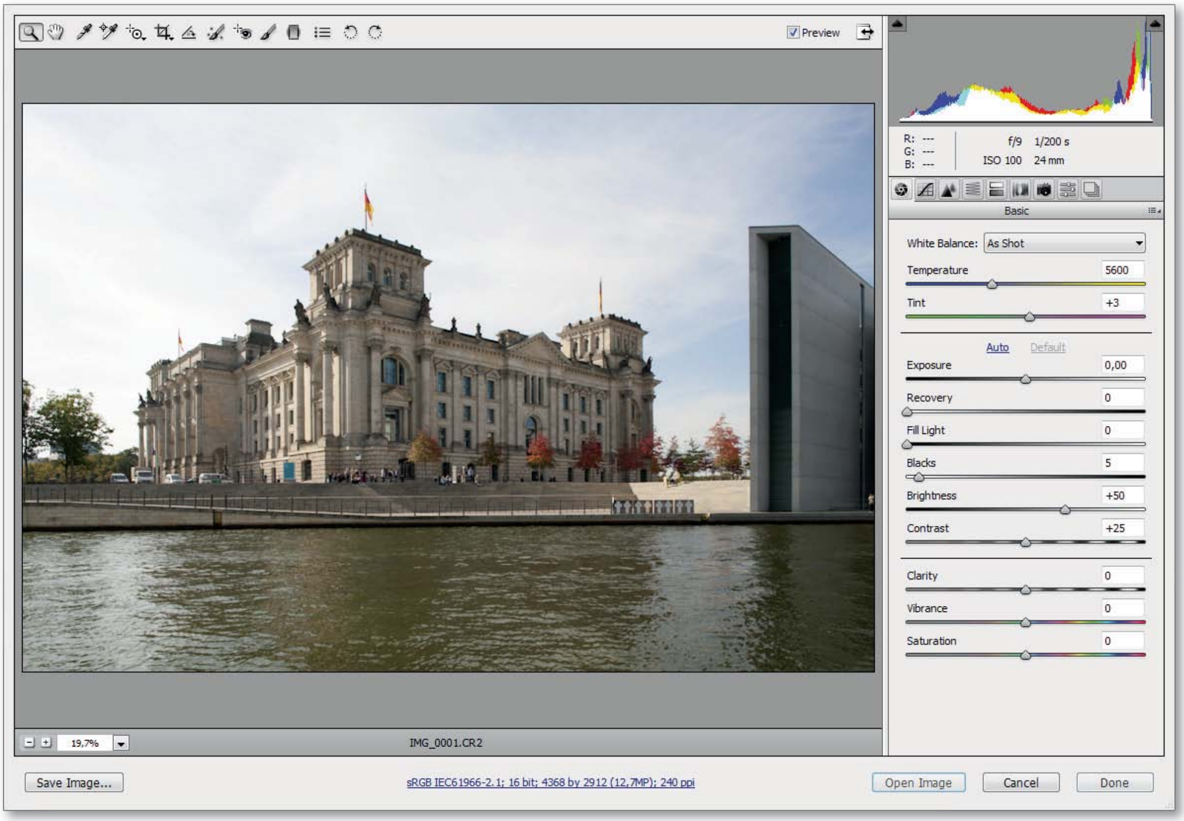


Figure 213

2. The first step adjusts the white balance. The relevant settings can be chosen from the palette ***Basic*** in the ACR converter. There are three different methods for adjusting white balance: The sliders for *Temperature* and *Tint* can be moved until the image is properly adjusted. There is also the *White Balance tool* (figure 214). Finally, there are standard settings corresponding to *Daylight*, *Cloudy*, and *Shade*. In practice, however, these settings are only rough values which rarely deliver perfect results. The setting *Auto* may be activated, but automated processing often leads to less than ideal results. For manual white balance, you would first use the *Temperature* slider until the color temperature in the image is properly adjusted. If necessary, small adjustments can be made with the *Tint* slider underneath. The half-automated method with the *White Balance tool* is in theory more precise, but realistically it cannot be used with all subjects. For this method, you first identify an area of the image that is not too dark and corresponds to neutral gray in the real world. Then select it with the eyedropper tool. The RAW converter now calculates the white balance based on this area. In our example, the side of the Paul-Löbe-Haus facing toward the right edge of the image is ideally suited for this (figure 215). However, not every image has a gray patch that is well suited for correcting white balance. In such cases, it becomes necessary to slowly approach the best settings by experimenting with the *Temperature* slider. Luckily, architectural photography differs from fashion or product photography in that it does not demand perfect white balance. It is often more important to match the white balance with the general mood of the image.

Figure 214

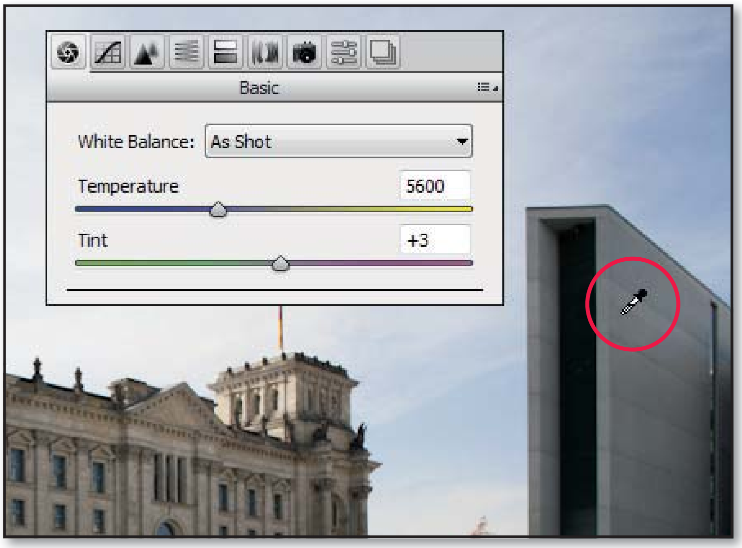


Figure 215

3. The next step is a close inspection of the ***Histogram*** in the upper control surface. This is a graphic representation of the distribution of brightness values within the image (see page 113). Our example shows a wide range of brightness levels. The bright, large sky shows up as major spikes on the histogram's right side. To control clippings of highlights and shadows, activate the triangular icons *Shadow clipping warning* and *Highlight clipping warning* at the top of the histogram. In the preview, they will show highlight and shadow areas that are rendered without any detail due to over- or underexposure (figure 216). The visual aid marks these areas in two different colors. Clipped highlights are marked in red, clipped shadows in blue. In our example, the areas are relatively small because the image exposure was very precise and even. For every picture, the histogram is an excellent reference tool; it always shows the values objectively, whereas the representation of light and dark areas varies from monitor to monitor.

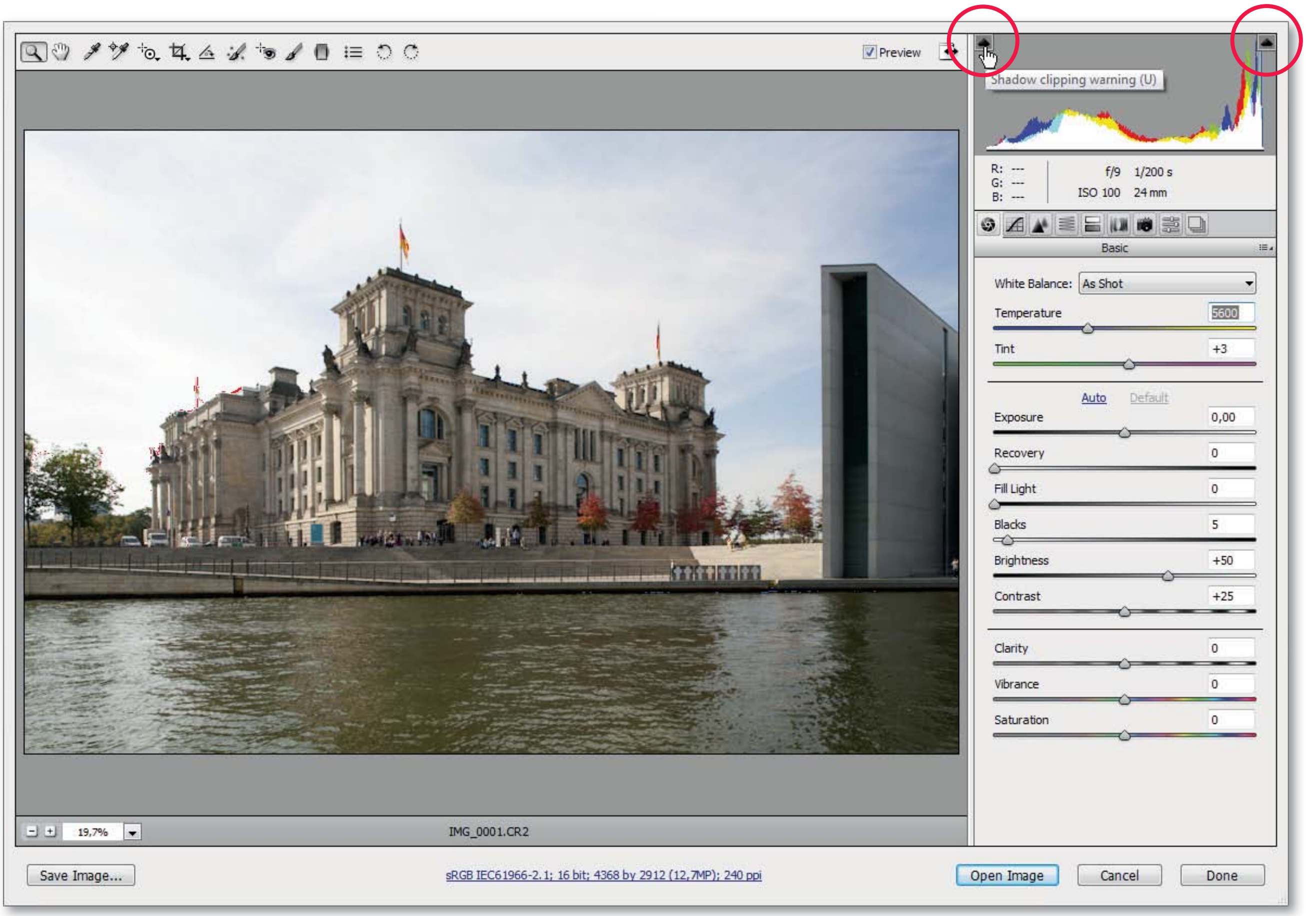


Figure 216

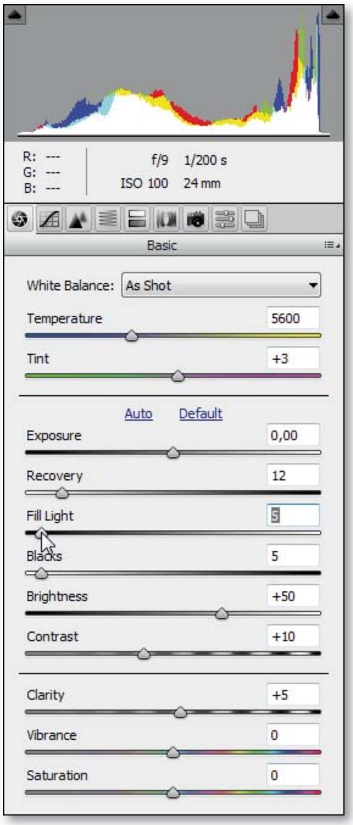


Figure 217

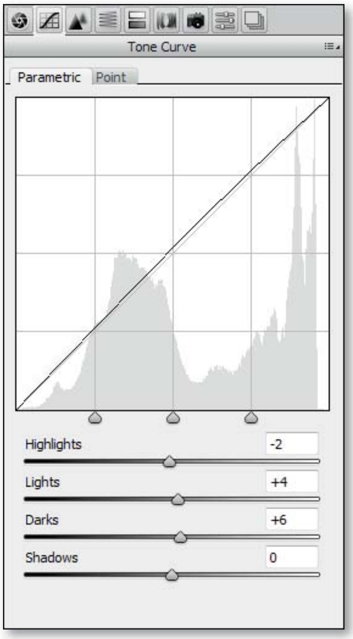


Figure 218

4. In the following step, we can make further corrections in the ***Basic*** panel. In order to use the source material's entire dynamic range, it is a good idea to slide the *Contrast* slider somewhat to the left, and to adjust shadows and highlights individually by using the *Recovery* and *Fill Light* sliders (figure 217). As a consequence, the overall contrast is reduced, and the histogram contracts. The image will appear less three-dimensional and less brilliant, but the risk of cutting off shadows and highlights in subsequent processing steps is also reduced. The contrasts can be individually enhanced again later. The *Clarity* setting increases the local contrast within the image, but it can also lead to unwanted halos on contrast-rich edges—so this setting must be used with great care. The sliders for *Vibrance* and *Saturation* can be left in the neutral position because they can be adjusted with more precision in later parts of the workflow.

5. The ***Tone Curve*** panel can be used for precise corrections. Adjusting the tone curve determines the brightness within the image. The ACR converter offers two methods: *Point*, which allows for manipulating the curve directly, or *Parametric* for choosing the desired parameters. The latter is done via four sliders: *Highlights*, *Lights*, *Darks*, and *Shadows*. With these, the corresponding tonal ranges can be raised or lowered. Both methods are adequate, so the one chosen depends on personal preference. In our example, only small corrections are necessary. The middle range was enhanced a little, and the highlights were reduced (figure 218). In some cases, it might be necessary to darken bright sections by adjusting the curve, or to enhance the contrast by making a slight S-curve.

6. In the ***Details*** panel, it is advisable to perform only minor *Sharpening* because this should be one of the final steps in the digital workflow. If high values are set at this point, unsightly sharpening artifacts may appear in later steps. It is best to set the *Amount* value between *10* and *20*, the *Radius* not higher than *1*, and *Detail* between *5* and *15*. The slider for *Masking* can be left at a low setting. To assess the sharpening setting, select a detail-rich section and zoom in to the 100% view (figure 219). The ACR converter keeps the *Noise Reduction* relatively simple. Effective noise reduction works much better with Photoshop plug-ins because they identify the exact type of noise. However, a slight reduction of color noise via the *Color* slider can and should be done as part of the color corrections.

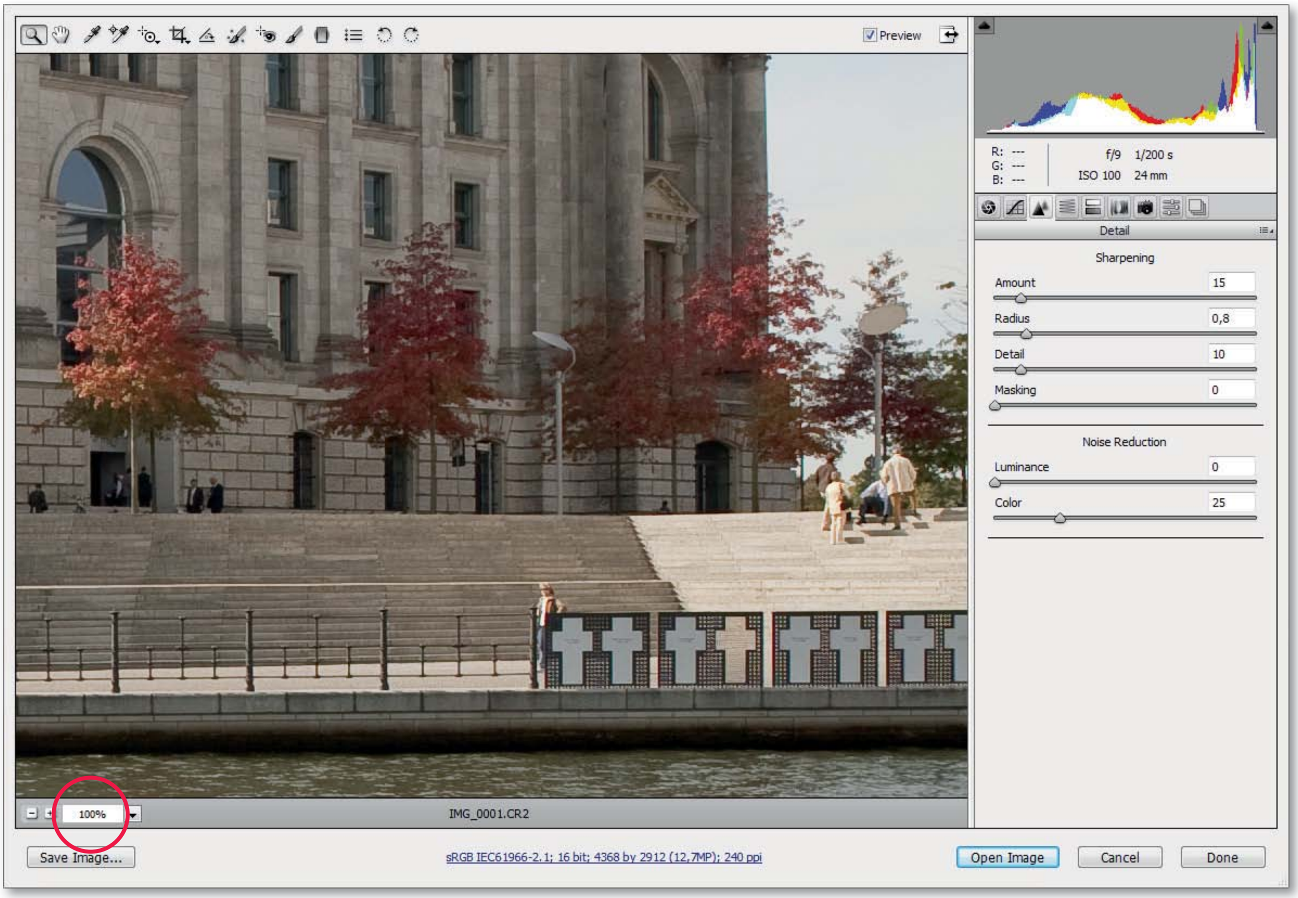


Figure 219

7. In addition to the *Basic*, the *Tone Curve*, and the *Details* panels, individual color correction tools can be found in the ***HSL / Grayscale*** panel. HSL stands for *Hue*, *Saturation*, and *Luminance*. *Hue* is used to execute small corrections within selected colors. In our example, the sky's blue is corrected for the redness typical of digital images (figure 220). Color intensity can be corrected with the *Saturation* adjustment. It is possible to completely eliminate certain colors and enhance others. This type of correction creates abstract images that range from unreal to suspenseful. But in most practical applications, the *Saturation* adjustment is usually employed for small intensity corrections that become necessary as a result of earlier manipulations. While bright areas that were manually darkened or dark areas that were manually brightened automatically seem to have more intense colors, the darkening of already dark areas and

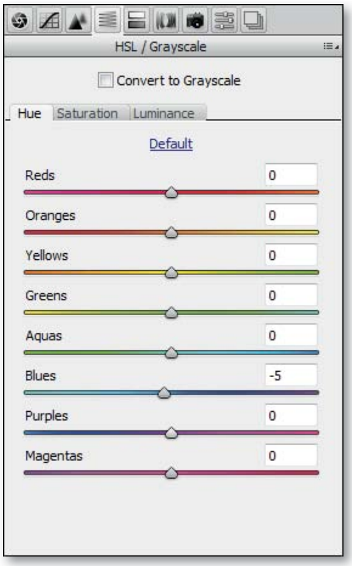


Figure 220

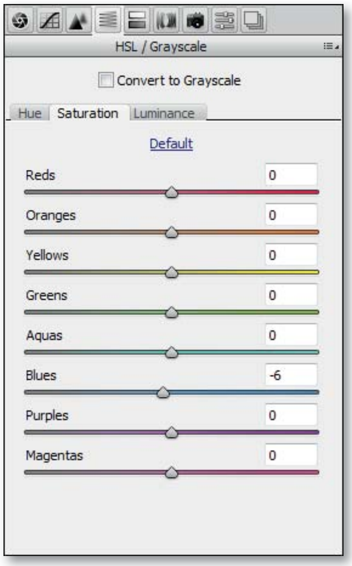


Figure 221

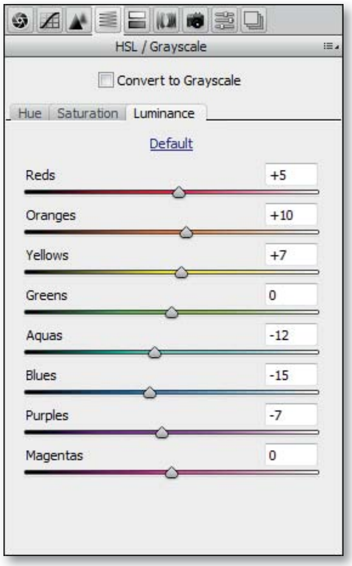


Figure 222

the brightening of already bright areas results in some loss of color intensity (figure 221). *Luminance* defines the brightness values of respective colors. In our example, blue tones are darkened to give the sky more definition. A slight increase of yellow and red tones leads to a softening of the building's shadow on the north façade (figure 222). For a conversion to black and white, activate the check box under *Convert to Grayscale*. This combines all three HSL settings into one called *Grayscale Mix*. By moving the respective sliders, gray values can be set for each color individually. With a little experimentation, one can produce black and white images with a unique look.

8. The ***Split Toning*** panel allows the individual adjustment of colors for bright and dark areas. This may be helpful when areas in the shadows show up tinted while other areas show in the correct colors. The tool is also useful for tinting images that have been converted to gray scale in the preceding step. These settings are seldom used in daily practice. In our example, no adjustments are made here.

9. The next panel, ***Lens Corrections***, is almost always used by architectural photographers doing RAW conversions. Optical phenomena caused by the lens, such as color fringes, so-called chromatic aberrations, and *Lens Vignetting* (i.e., a fall-off of light toward the

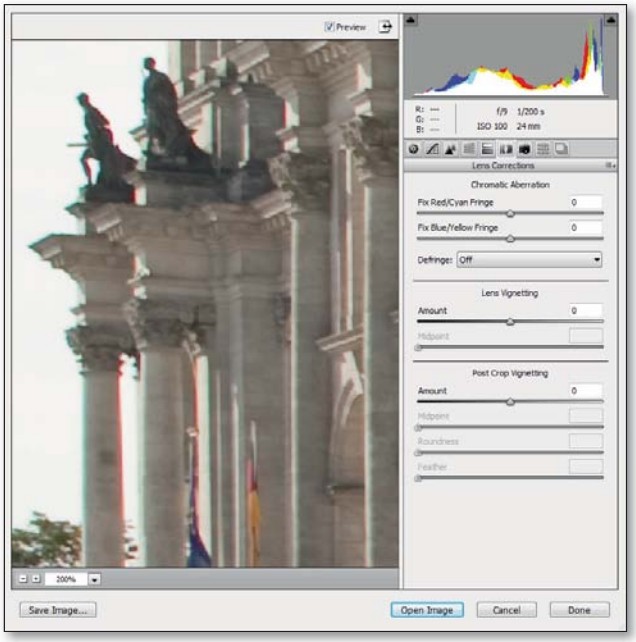


Figure 223

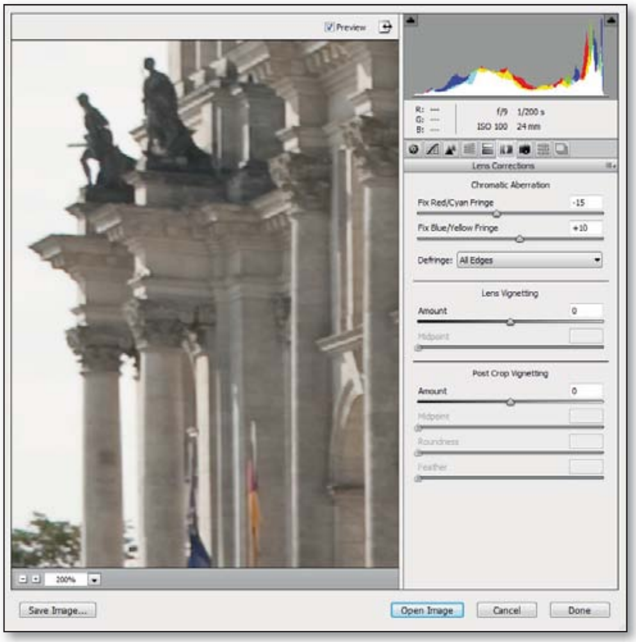


Figure 224

corners of an image) can all be corrected. Our example used a shift lens with a moderate shift position, a larger image circle, and a stopped down aperture, so vignetting associated with the lens was only a minor consideration. Other lenses may cause much stronger vignetting and dark corners may also be much stronger depending on the situation and chosen aperture. Therefore, the *Amount* and *Midpoint* values must be adjusted each time. Chromatic aberrations usually show up as red or cyan tinted areas, but some lenses produce the same phenomena in yellow or blue. In most cases, they cannot be completely removed. There is no solid rule for the process. In general, one should use the 100% or 200% view and choose a contrast-rich section at the edge of the image with strong chromatic aberrations (figure 223). In the *Chromatic Aberration* environment, we can first adjust the *Fix Blue/Yellow Fringe* slider until all edges have typical red/cyan colors. These can then be eliminated with the *Fix Red/Cyan Fringe* slider. In the *Defringe* input area, there is an option for *All Edges*. This is perfectly suited for removing aberrations completely (figure 224). If specific lens values are entered in ***Presets***, they can be recalled for fixed lenses and similar aperture settings (figure 225). Zoom lenses are a different matter. Their aberrations depend on the focal length, so the ideal correction settings can vary a great deal.

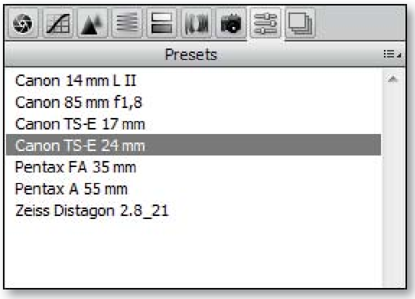


Figure 225

10. The ACR converter offers yet more options. (We will not use them in our sample picture.) One example is the *Spot Removal tool* (figure 226). This is a great way to remove specks caused by dust on the sensor. This tool is very intuitive in its application and effectively removes spots in big surfaces, such as the sky. Other useful functions are the classic *Crop* and *Straighten* tools (figure 227). The latter allows you to draw a virtual line through the picture, which the software then uses to straighten out the image. This works well with horizontal as well as vertical edges. However, when doing RAW conversions, you should refrain from using the *Crop* and the *Straighten* tools if you plan to correct distortions later on in the work flow. The correction parameters used by software such as PTLens or LensFix are applied to the entire image surface, and the results will not be entirely accurate if the image has already been altered. A comparatively new tool is the *Graduated Filter* that can be useful for particular applications (figure 228).

Figure 226

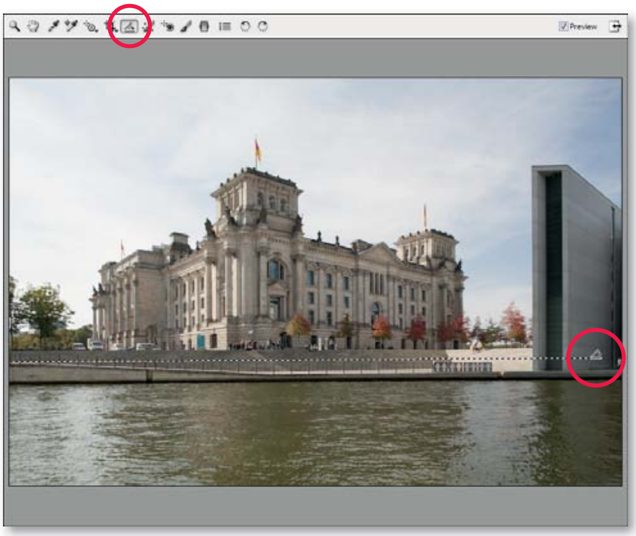


Figure 227

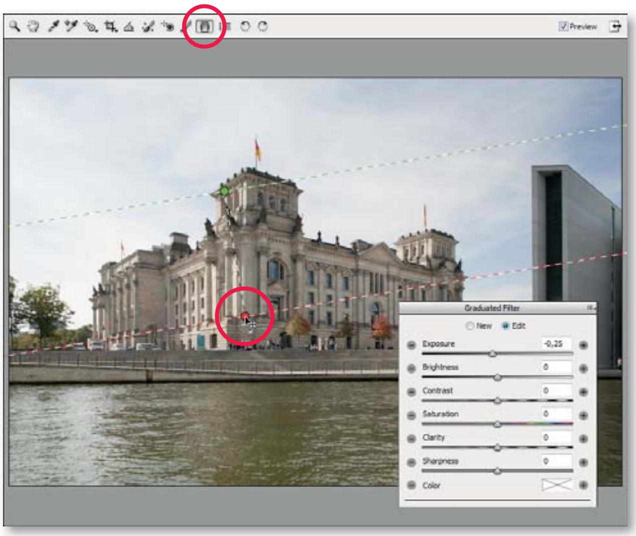


Figure 228

11. Before initiating a conversion with the *Open Image* button, take one final look under the output settings, at the ***Workflow Options***. This dialog box can be opened by clicking on the blue, underlined image descriptions at the lower edge of the ACR converter. Here you have the option of choosing the Color Space (*Space*) for the image. In general, the sRGB color space (*sRGB IEC61966-2.1*) is best suited for images intended for the Internet or for processing at a photo lab. The larger Adobe RGB color space is better for prepress or for any instance when you use an output device capable of

showing this enlarged color range. (This includes special monitors and some high-end ink jet printers.) In every case, *16 Bits/Channel* should be selected for *Depth* in order to prevent the color range from being confined. The downside is that this setting generates a need for greater computer processing power. If the machine is low on power, one might consider reducing the color depth setting to *8 Bits/Channel*. The *Size* setting should usually be left alone. In some special cases (for example, creating an extremely large print), it is a good idea to interpolate the image to a larger format at this step, when the software is still working with the unadulterated raw data. This will ensure the highest possible quality. The value for *Resolution* can be set to anything. It has no bearing on the actual resolution, but it reflects the size of a displayed image at a given pixel density. Finally the *Sharpen For* setting should usually be set to *None* and the checkbox *Open in Photoshop as Smart Objects* unchecked. (figure 229).

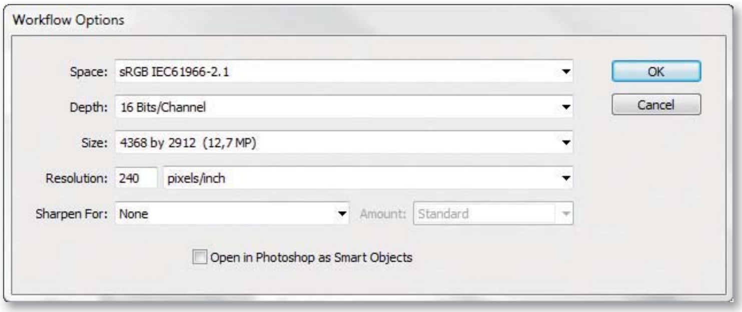


Figure 229

Summary: RAW Workflow Using the ACR Converter

- *Setting the white balance (adjusting colors according to subject)*
- *Optimizing the histogram (exposure, contrast, shadows/highlights)*
- *Fine-tuning the curves*
- *Slight basic sharpening*
- *Choosing HSL/Grayscale settings according to the desired effect*
- *Correcting vignetting and chromatic aberrations*
- *Removing spots and cropping or aligning frame if necessary*
- *Checking workflow options*
- *Converting the image*

4.3 Post-Processing

4.3.1 Image Corrections

Processing does not end with RAW conversion. The conversion simply produces the best source material for further corrections and manipulations. The following sequences form an example of a possible workflow. It is not necessary to follow it to the letter. Over time, every user of image processing software develops individual ways of doing things. However, it should be noted that changing the order of some steps could have a negative effect on the result. For the beginner, it is best to use the following workflow as a guide.

Workflow: Image Corrections in Photoshop

1. Using the RAW converter options, we performed adjustments of white balance, exposure and colors, reduced chromatic aberrations, and removed slight vignetting. After conversion, our sample picture ended up as a 16-bit file (figure 230).

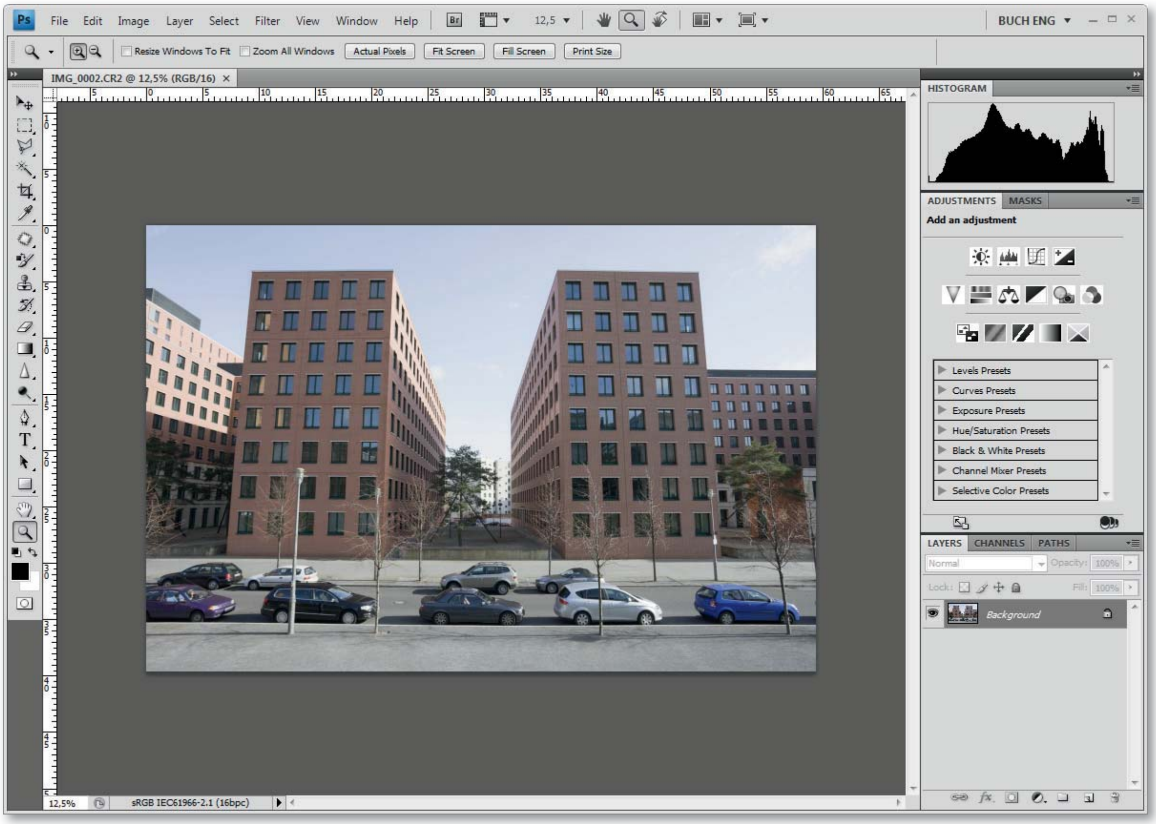


Figure 230

2. Changes to framing or a correction of converging verticals should be done simultaneously or after the correction of lens-induced distortions—never before, since distortion correction is only precise if the entire image is processed.

Distortion and Perspective Corrections in Photoshop: Photoshop contains a useful tool which enables the image editor to remove image distortions from the picture by using visual criteria. This tool can also be used for perspective corrections. Beginning with Photoshop CS2 and above, the relevant window can be found under *Filter > Distort > Lens Correction*. In our example, moving the *Remove Distortion* slider slightly to the right corrects the barrel distortion typical for wide-angle lenses (figure 231). The ideal setting depends on the lens and focal length. To facilitate the visual control, it is best to perform perspective control in this step as well. The optimal values are found by combining the two correctional measures. Crooked lines stand out more once perspective is corrected, and without crooked corners, the building can be more easily aligned with the grid. To remove converging verticals, we use the sliders in the *Transform* area. In our example, we need only one correction using the *Vertical Perspective* sliders. For images

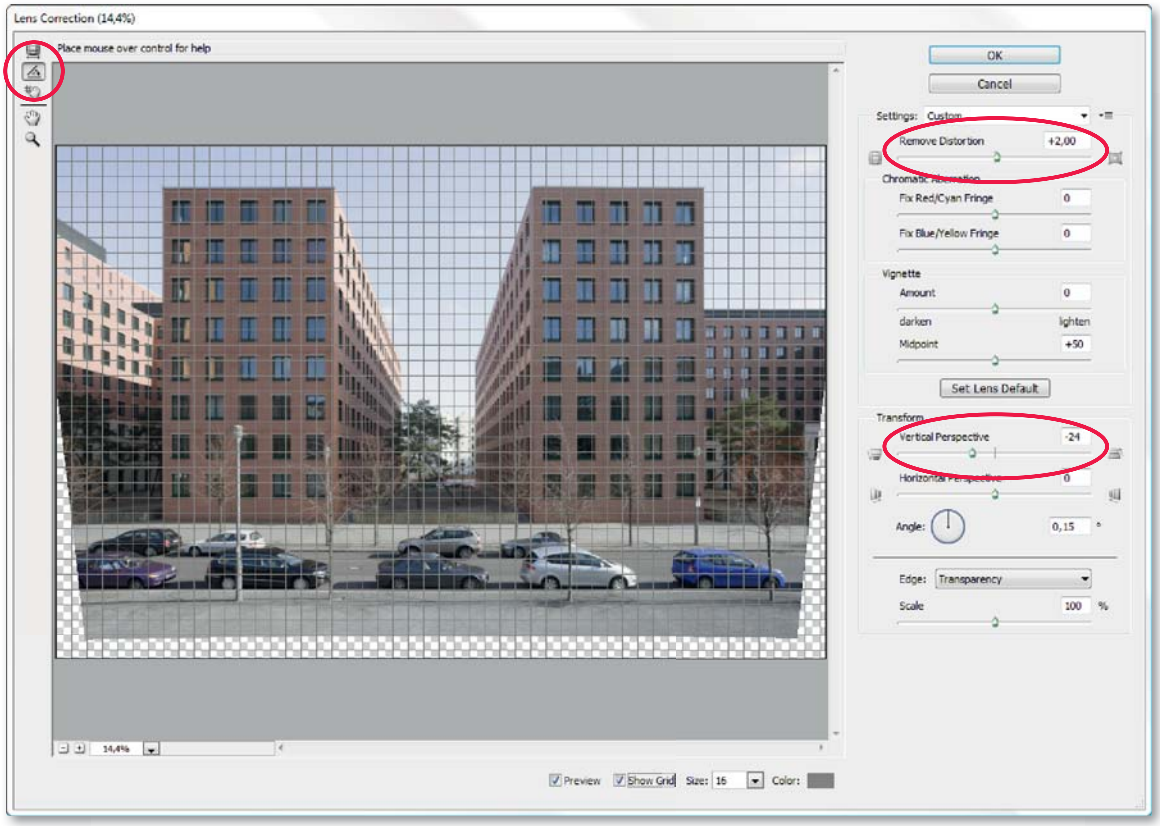


Figure 231

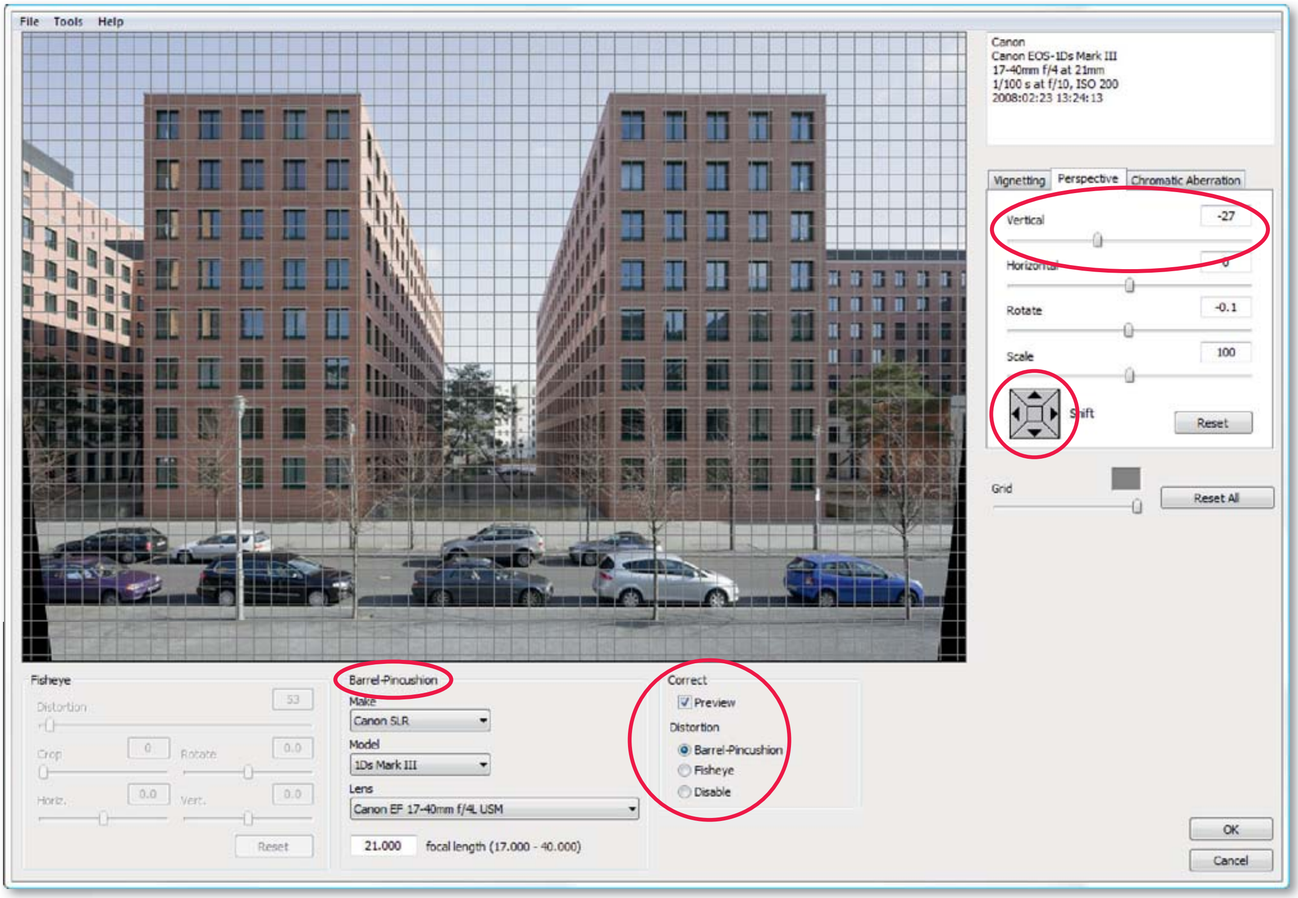


Figure 232

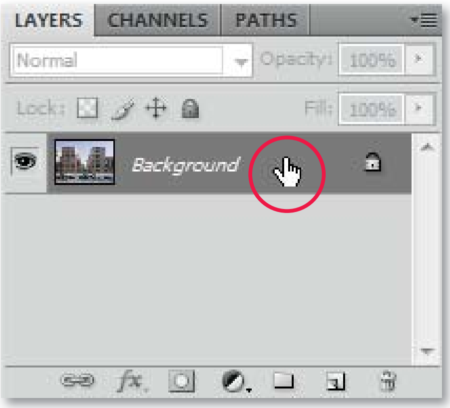


Figure 233

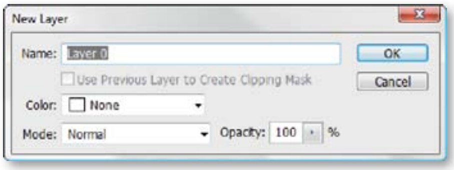


Figure 234

in which the film or sensor orientation does not exactly line up with the building, the *Horizontal Perspective* slider may be used. The *Straighten tool* compensates for the slight twist of the image already seen in the RAW converter. The principle is the same: A virtual line is drawn through the image, and the software reorients the image parallel to the line. After clicking *OK*, the software reverts to the original workspace.

Distortion and Perspective Corrections with Plug-ins: More exact solutions are available with tools such as PTLens or LensFix (for Mac). Both employ the same database of camera-lens combinations and make it possible to perform automatic corrections. Unlike Photoshop, these programs also automatically correct wavy distortions. To take advantage of these software tools, modern lenses must be used in combination with digital SLR cameras capable of filing camera, lens, and focal length data along with the picture's Exif information (see page 182). In our example, we process the sample image with the plug-in version of PTLens. First, we open PTLens through the menu choices *Filter > ePaperPress > PTLens* and locate the *Barrel-Pincushion* area (figure 232). In most cases, the software will detect the camera model, lens, and focal length from the Exif data. Sometimes, these choices must be

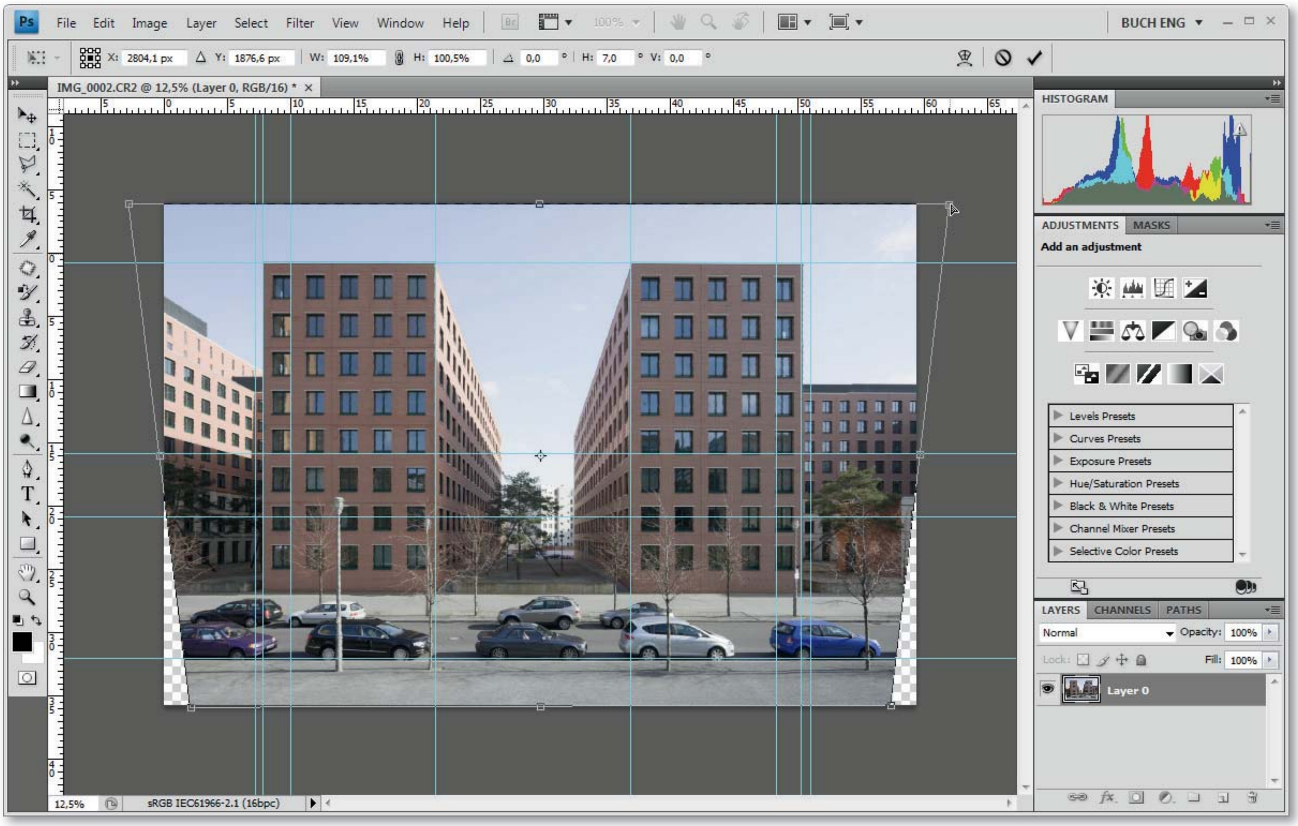


Figure 235

made by hand (but usually only once). If the *Correct > Preview* box is checked and *Barrel-Pincushion* is active, distortion data are retrieved from the database and applied to the image. The results can be seen right away. Labor-intensive manual adjustments are redundant, and the result is very precise. The sub-window *Perspective* now allows the perspective correction as explained above. The grid should be turned on. PTLens also offers the option of moving the picture via a four-way lever. Ideally, vignetting and chromatic aberrations should be corrected during the RAW conversion, but that can also be done here. We click *OK* to apply the changes, and the software takes us back the previous workspace.

Perspective Correction Using the Transform Command: Distortion-free images (or images after distortion correction) can also undergo perspective correction with the Photoshop command *Transform*. First, guide rulers are drawn or the grid is turned on. (The necessary commands can be found in the *View* menu.) Next, the background layer is made editable by double-clicking on the layer's thumbnail (figure 233) and then clicking *OK* in the resulting dialog box (figure 234). In our example, the layer is now called *Layer 0*. Via the *Edit > Transform > Perspective* or *Distort* command, respectively, the image perspective can now be distorted at will (figure 235). It is important not only to move the upper corners outward, but also to move the lower corners inward. Otherwise, the

Figure 236

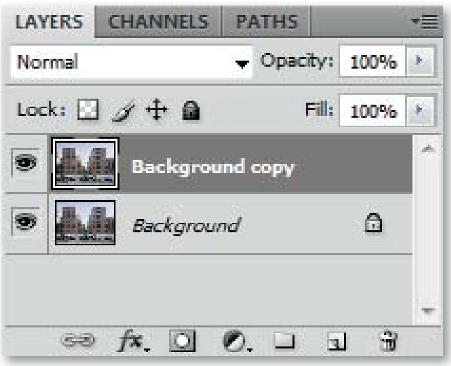


Figure 237

image will look vertically compressed and the strong interpolation will lead to visible jaggedness in the upper image area. After the correction, *Layer 0* can again be sent to the background (*Layer > Flatten Image*).

Adjusting the Image Frame: Cropping the image is best done after performing the steps above. First, we use the *Crop tool* to draw a frame around the selected areas of the image and confirm the choice by double-clicking (figure 236). In our example, we are interested in the largest possible image area showing the subject, but this also alters the aspect ratio. To counteract this change, we crop to a specific aspect ratio. To do this, we activate the *Rectangular Marquee tool* and then select *Style > Fixed Ratio* from the tool options bar entering the aspect ratio (*Width* and *Height*) before drawing our rectangle above the selected section. Then we select the *Image > Crop* command.

3. The following steps demonstrate various methods for selective brightness adjustments. **Selective Darkening:** In our example, we want to begin by darkening the sky. First, we duplicate the background layer (*Layer > Duplicate Layer*) before making adjustments in

the newly created layer (figure 237). If there is a clearly defined transition edge between the sky and the building, we can select the sky by applying the *Magic Wand tool*. Holding the Shift key enables you to expand the selection. When complex structures such as trees reach into the transition area, another method works better. From the *Select > Color Range* menu selection, we access a window where specific brightness and colors can be selected. Under *Select*, we select *Sampled Colors* and then click on an area of the sky in the preview box. White areas mark the selected surfaces, and the deselected surfaces show up in black (figure 238). With the *Add to Sample* eyedropper, all other areas of the sky can be selected. The *Fuzziness* slider should remain at the lower setting. The ideal value depends on the subject, and must be customized individually. This method always adds areas outside of the desired sky which can be corrected in a subsequent step. What is important is that the transition from the sky to the building and to its surroundings is clearly defined (figure 239).

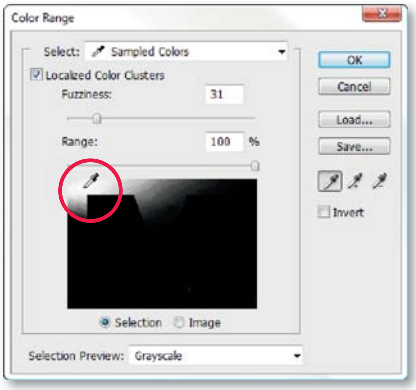


Figure 238

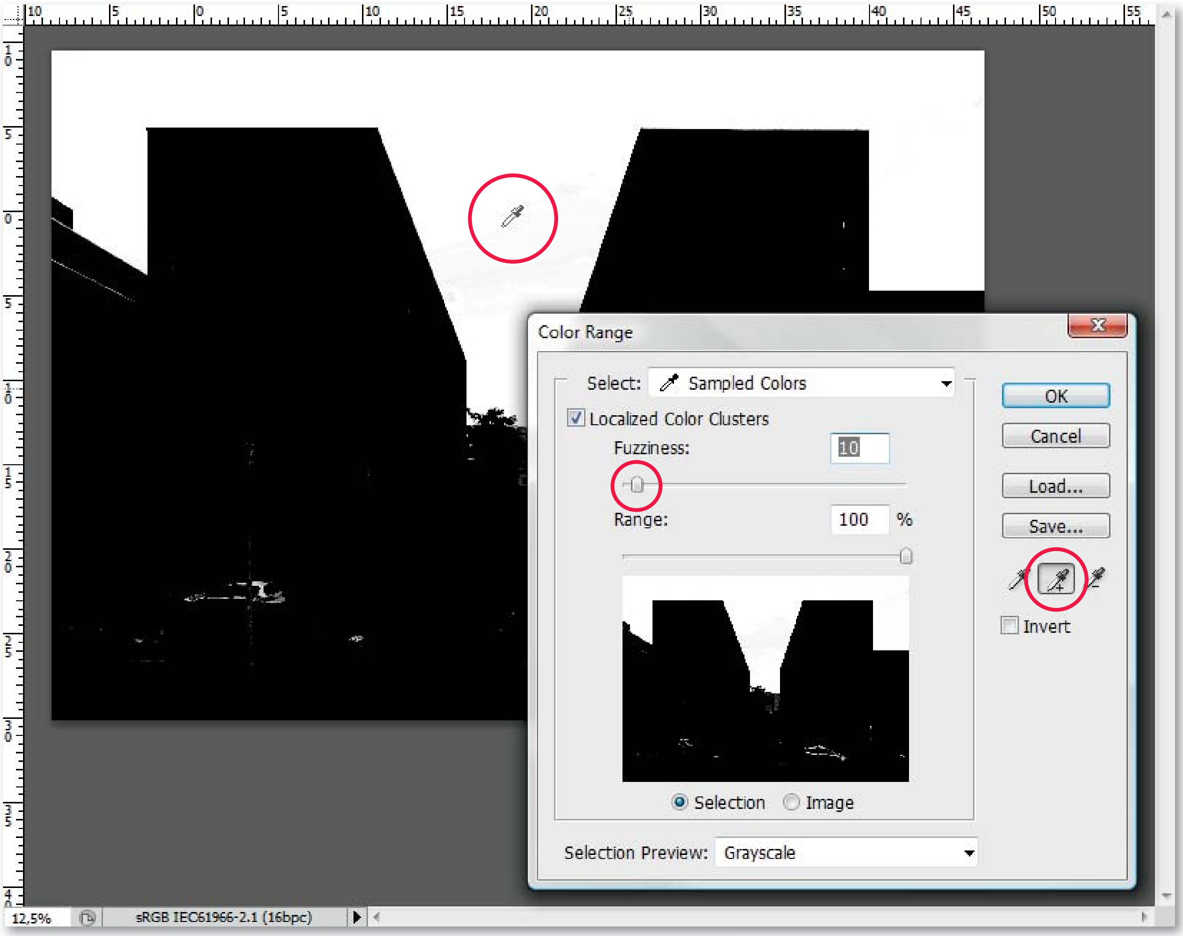


Figure 239

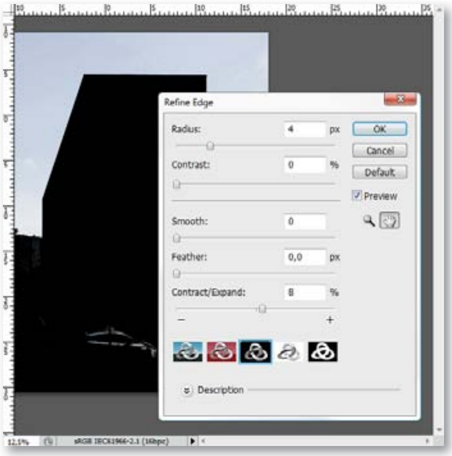


Figure 240

After clicking the *OK* button, the selected areas show up in the main window. Since Photoshop CS3, the *Refine Edge* command can be used for fine tuning the edges. This window can be opened from the tool options bar or the *Select* menu. The ideal values for *Radius* and *Contrast* must be determined with experiments, and the *Smooth* and *Feather* sliders should be set to *0*. To avoid halos around the selected edges, it is advisable to set the *Contract/Expand* slider between *+5 %* and *+10 %*, which slightly expands the selection (figure 240). In Photoshop versions prior to CS3, the *Select > Feather* command does a similar job. The radius value has to be set between *0.5* and *1.5* pixels. After clicking the *OK* button, we check to make sure that the duplicated layer is active before choosing the *Add Layer Mask* command (figure 241). This layer mask results in a different opacity of the top layer. In this manner, entire areas of a

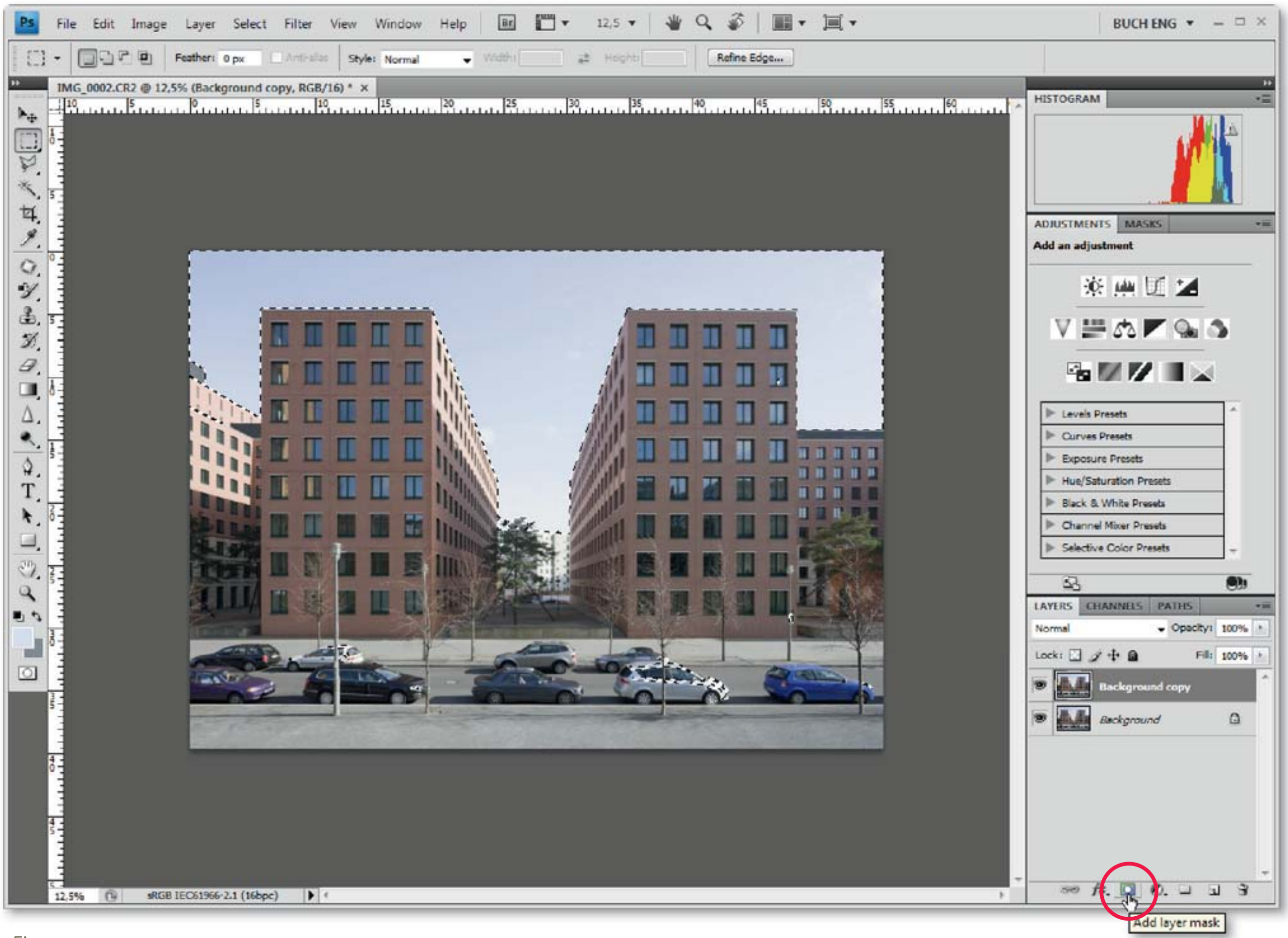


Figure 241

layer can be faded out without deleting any pixels. The faded out areas can be reconstructed with ease, for instance by painting with a white brush within the layer mask. In the next step, we make the black and white layer mask visible by clicking on it while holding the Alt key (figure 242). Afterwards, we use a black brush to paint over all white areas outside of the sky. As an alternative, we could select all areas not belonging to the sky with the *Polygonal Lasso tool*, for example (figure 243). After selecting the relevant area, we

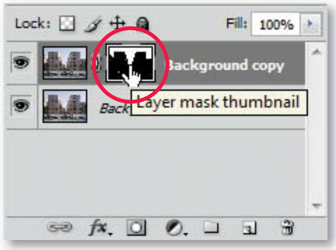


Figure 242

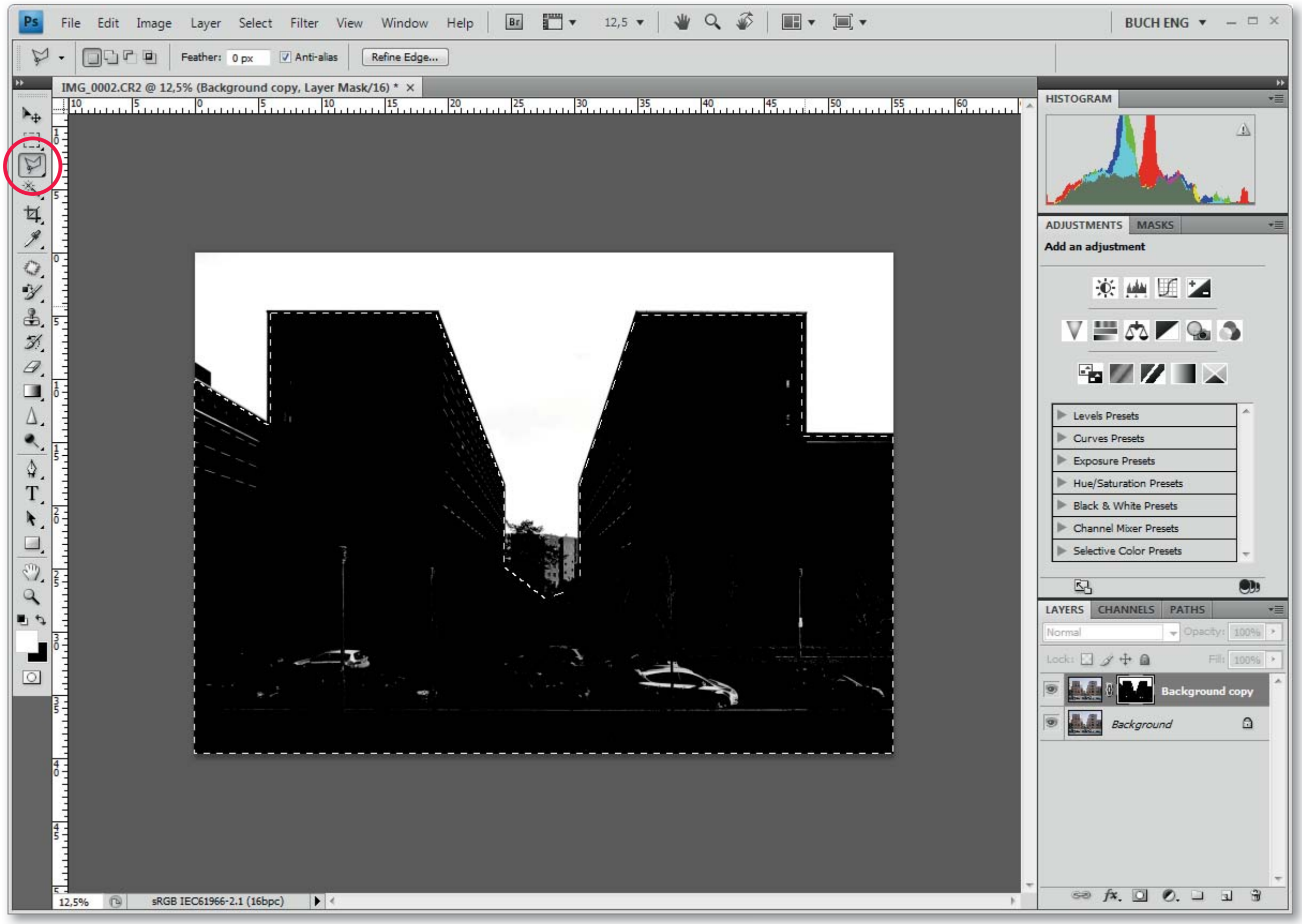


Figure 243

open the *Fill* option from the *Edit* menu, then select *Use > Black* in the dialog box that pops up (figure 244). This technique can be repeated in other image areas. Detailed corrections can now be done with the *Brush tool*. After selecting the layer thumbnail again, we darken the selected part of the sky in the upper corner by selecting Levels from the *Image > Adjustments* menu and sliding the

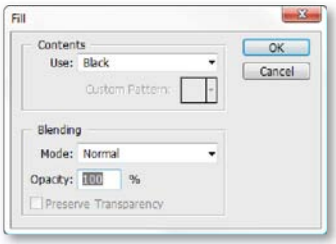


Figure 244

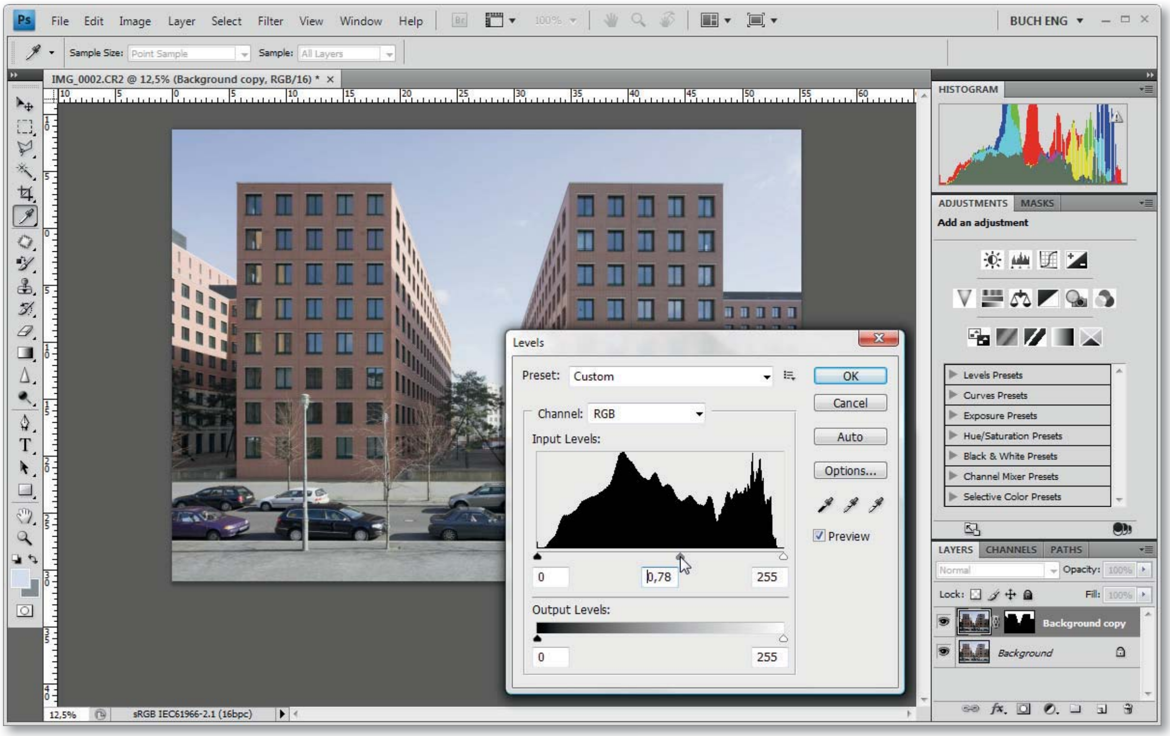


Figure 245

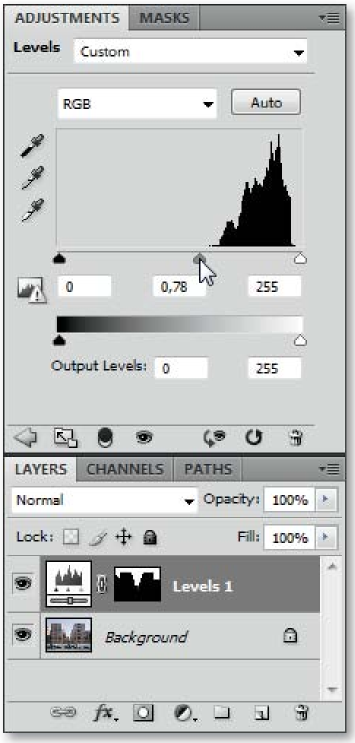


Figure 246

gray triangle in the middle slightly toward the right side (figure 245). This preserves shadows and highlights while darkening only the midtones. As an alternative, *Curves* can be used. Because we are working with a layer mask, all changes only apply to the selected areas. Another elegant option is to use an adjustment layer instead of duplicating the background layer in the first step. (*Layer > New Adjustment Layer > Levels* or *Curves*, respectively.) **Selective Brightening:** In the next step, we create another layer. (As soon as we work with at least two layers, they should be given individual names to avoid confusion.) With the new layer, "lighten" (figure 247), we will now make dark areas of the image brighter. We might use the color range selection again (*Select > Color Range*), select *Shadows* instead of the blue sky areas, and apply strong softening to the layer mask. Another method is demonstrated on our sample image. First, we activate the "lighten" layer by clicking on the layer's thumbnail, after which the entire image is brightened slightly by applying *Levels* (figure 248). As before, *Curves* can be used as well. Next, we create a new layer mask. It is white at first, but we fill it with black (figure 249) by selecting *Fill* in the *Edit* menu or the command *Image > Adjustments > Invert*. At first, the brightness changes we just completed disappear again. We select a large, soft

brush from the *Brush tool*, set the foreground color to white, and reduce the opacity of the brush to a small value (in our example, *30 %*). Now we can use the brush to paint over the selected, dark parts of the layer mask that are too dark (figure 250). Doing so makes the previously brightened image areas visible again. After the brightness changes are executed, all of the layers can be combined again into a single background layer (*Layer > Flatten Image*). A couple of other ways to brighten dark image areas or vice versa are explained in “Selective Contrast And Brightness Adjustments“ (section 4.3.2).

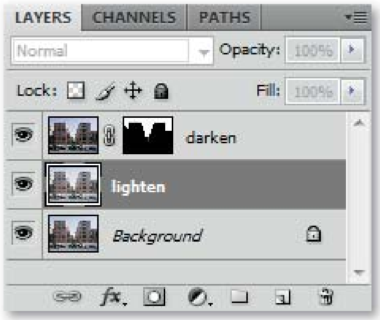


Figure 247

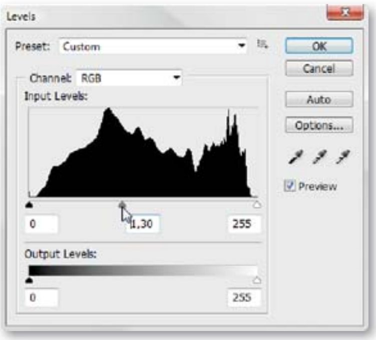


Figure 248

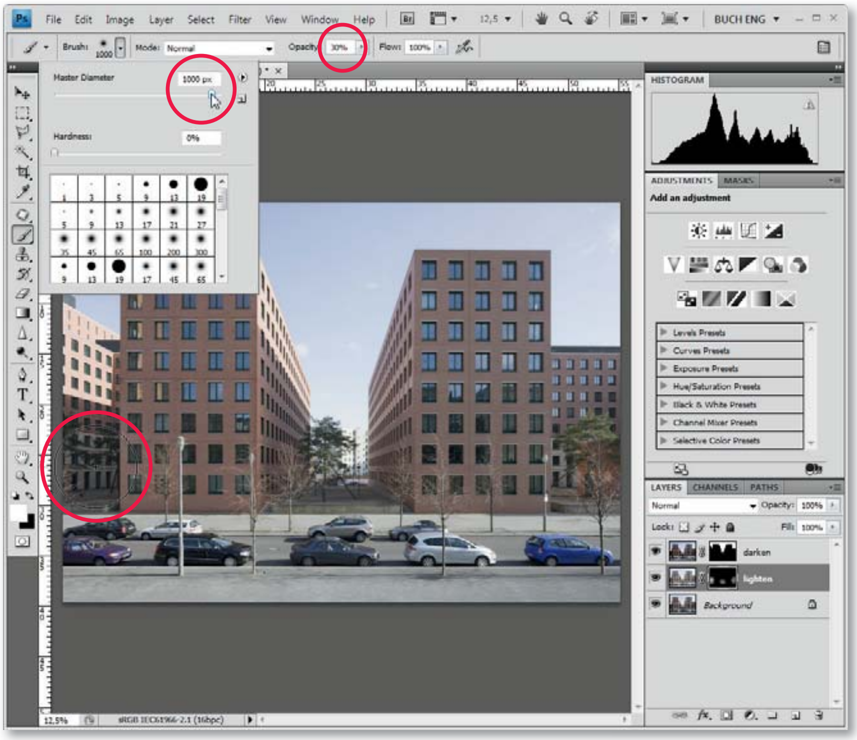


Figure 250

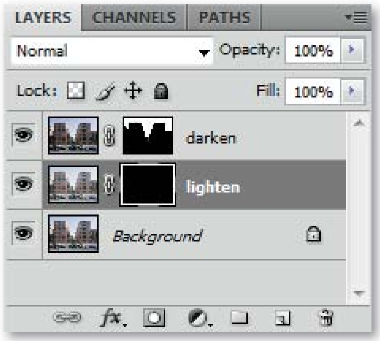


Figure 249

4. The next step would be to eliminate background noise from strongly brightened images or images produced with high ISO settings. Photoshop offers the command *Filter > Noise > Reduce Noise*. However, our example does not require any **noise reduction**. In general, noise reduction should be approached with caution, since it is always associated with some loss of detail. In most cases, an image with a small amount of noise looks superior to an image in

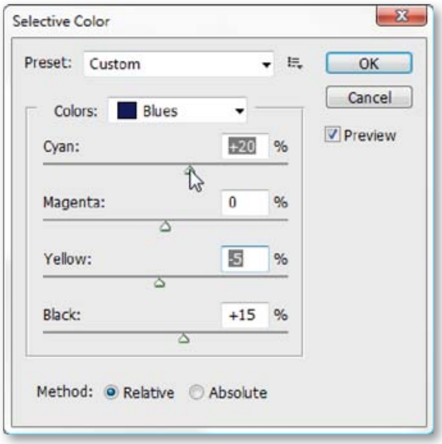


Figure 251

which fine details have become the victim of aggressive noise reduction. In addition to Photoshop's tools, there are many effective noise reduction plug-ins, for example Noiseware Professional, Neat Image, and Noise Ninja. Their acquisition can be worth it.

5. Next, **color corrections** can be done in addition to what has already been accomplished during the RAW conversion. In the *Selective Color* dialog box, under *Image > Adjustments*, we can make color corrections with great precision (figure 251). Depending on the subject and type of image, the settings will vary a great deal. Only experimentation will lead us to the desired result. To give our sample image a somewhat cooler look, we will first create a new layer by choosing *New > Layer* from the *Layer* menu and selecting *Color* as the blending mode (figure 252). Afterwards, we will color the new layer blue by choosing *Fill* in the *Edit* menu and sharply reduce the opacity of the new layer (figure 253). The result is a slight tint toward blue. By applying a layer mask, the effect can be limited to defined image areas. Another option is the *Photo Filter* (*Layer > New Adjustment Layer*), which can also be customized (and retracted at any time) in form of an additional layer (figure 254).

6. If necessary, the **saturation** can be enhanced or reduced in the same way by choosing *Layer > New Adjustment Layer > Hue/Saturation* (figure 255).

7. If, after these corrections, an image still lacks contrast, the histogram can be individually optimized by using the manual *Levels* function or the *Auto Contrast* function which stretches the histogram until the darkest parts of the image are rendered black and the brightest areas become pure white. (Both functions can be found in *Image* or *Image > Adjustments*, respectively.) Our sample picture already uses the entire range of the histogram, which is why only **local contrast** is enhanced. For this purpose, we again duplicate the background layer and adapt the *Unsharp Mask* function in the *Filter > Sharpen* menu. (Actually, this command is intended for sharpening the image.) Choosing a large *Radius* not only enhances the contrast along detailed edges, but also renders large image areas richer in contrast as a whole. The value can be adjusted based on the image and individual preference by moving the *Amount* slider (figure 256). The disadvantage of this method is the light overflows (halos or "blooming" effects) formed at the transitions from the contrast-rich edges to the larger image surfaces (figure 257). These areas can be retouched by applying a layer mask and using a black paintbrush. As this effect should be used in moderation, the opacity of the layer

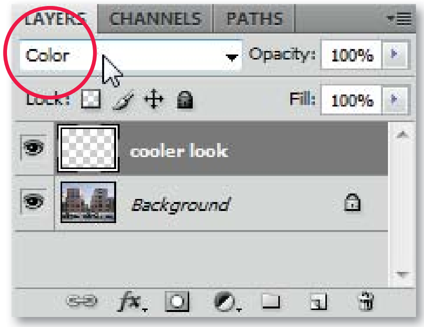


Figure 252

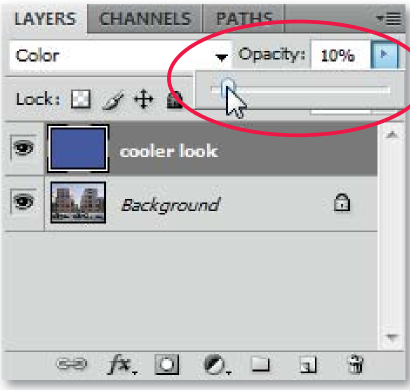


Figure 253

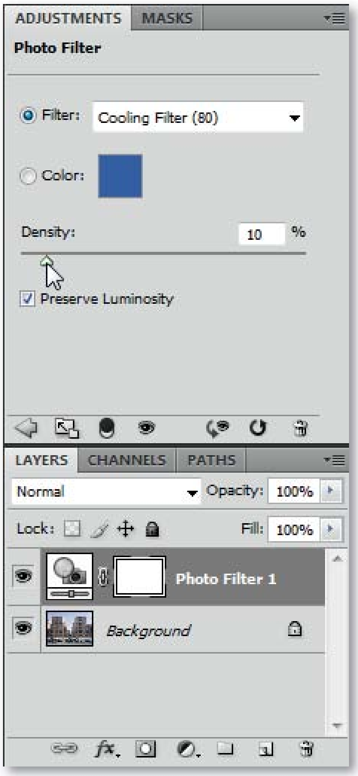


Figure 254

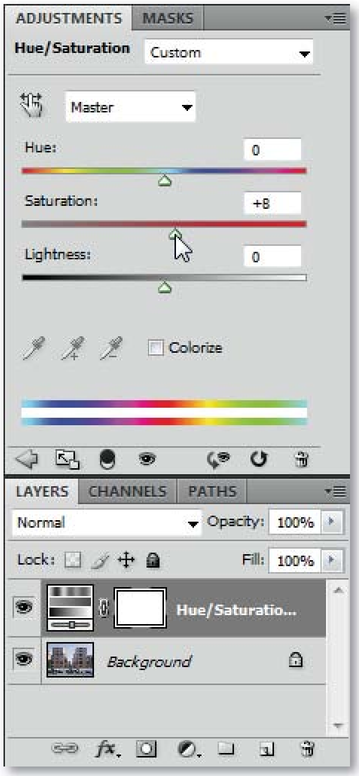


Figure 255

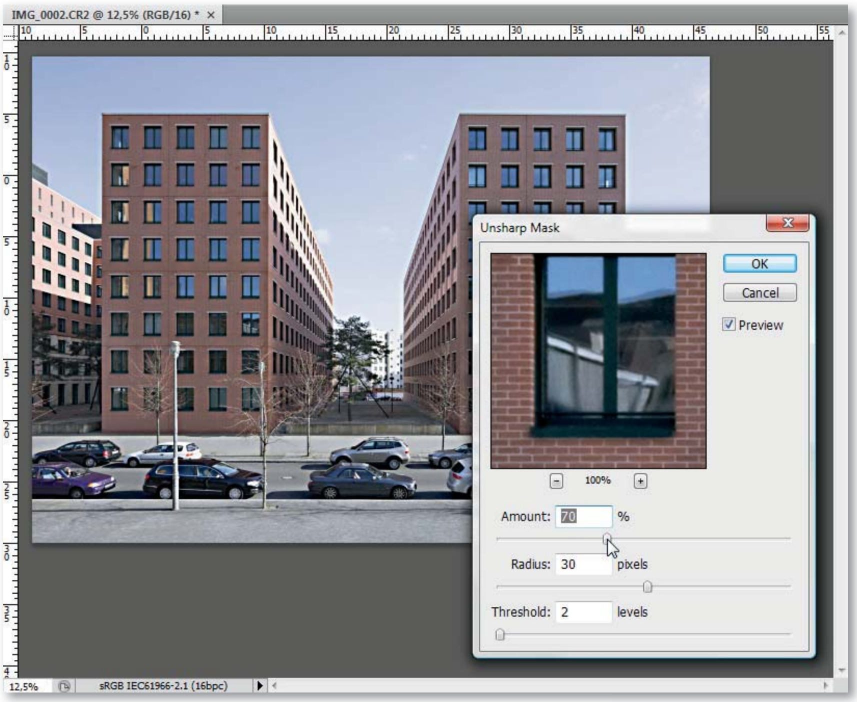


Figure 256

Figure 257

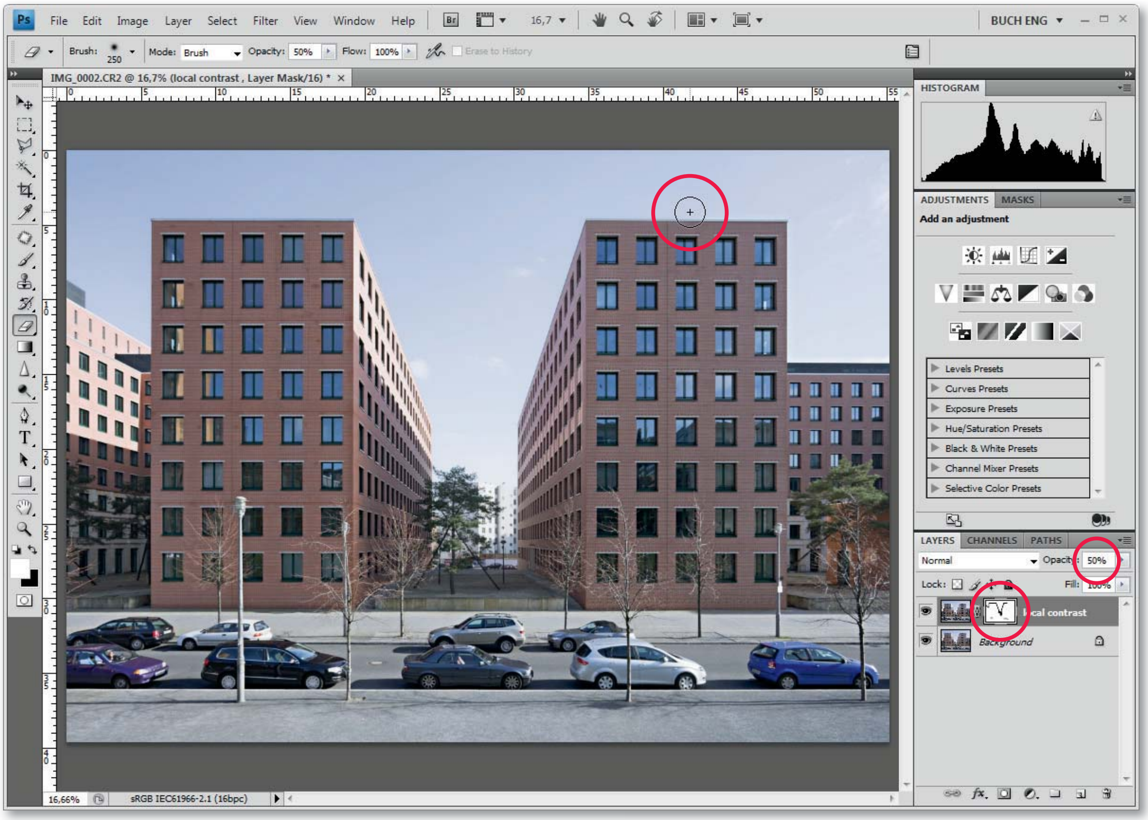


Figure 258

must be somewhat reduced (figure 258). An exaggerated application does more harm to the picture than one that is too discreet. After completing the procedure, all the layers can be combined into a single background layer.

8. One of the last steps in the workflow should be **sharpening** the image. Using the *Unsharp Mask* command yields excellent results if a moderate *Amount* is selected, the *Radius* remains between *0.3* and *1.0* (depending on the original sharpness of the image), and the *Threshold* is set between *0* und *3* (figure 259). If *Amount* and *Radius* are exaggerated, ugly sharpening artifacts will pop up (figure 260). Setting the *Threshold* too high will reduce the noise caused by the sharpening effect within flat image areas, but the actual sharpening effect is lost more and more. An alternative method to the *Unsharp Mask* command contained in later Photoshop versions is *Smart Sharpen*. In addition, complex sharpening tools like Nik Sharpener Pro or FocalBlade (figure 261) may offer even better results.

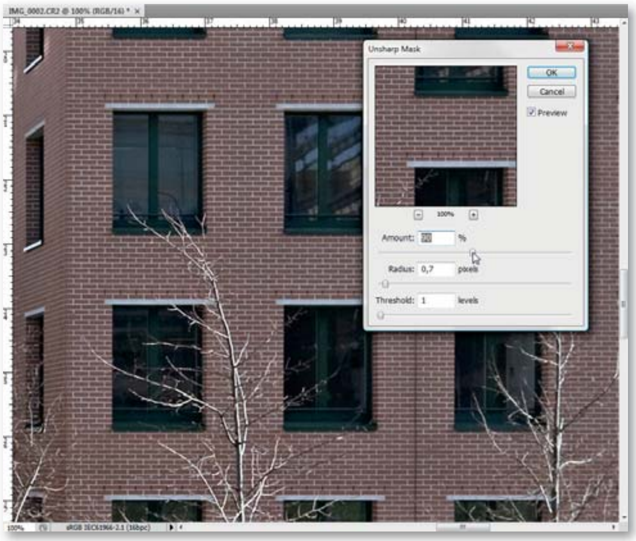


Figure 259

Figure 260

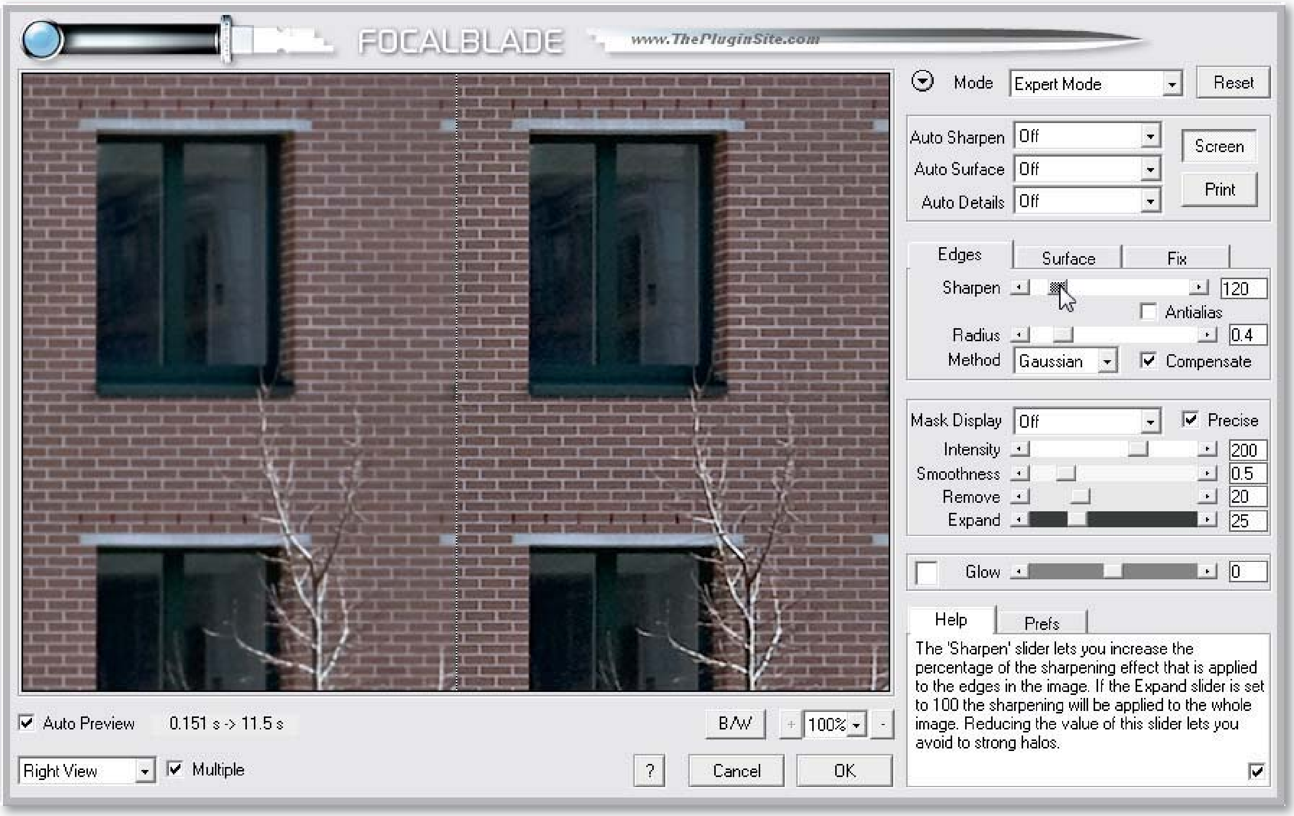


Figure 261

9. Before we close Photoshop, the image we worked on must be **saved**. The universal TIFF format or Photoshop's proprietary PSD file format are well suited for a lossless saving with high color depth. The downside of these formats is that they take a large amount of storage space. If the image will never be processed further, but needs to be archived without quality-robbing compression, the data set can be reduced to 8 bits before saving. This function is found under *Image > Mode > 8 Bits/Channel* (figure 262). To save the image in a more compact form, JPEG format with a low compression setting is ideal. From the export dialog box, select a JPEG *Quality* of *10* or *11*. For presentation on the Internet, the image should be reduced to a web-compatible size, for example 800 x 600 pixel by choosing the *Image > Image Size* command. Then select *Save for Web & Devices* from the *File* menu. It is important to define *JPEG* as the export file format and to set the *Compression quality* to *High* or *Very High*. Saving a file this way also removes Exif data (see page 182). Removing the checkmark in *Embed Color Profile* has a similar result as it deletes the color profile from the image data.

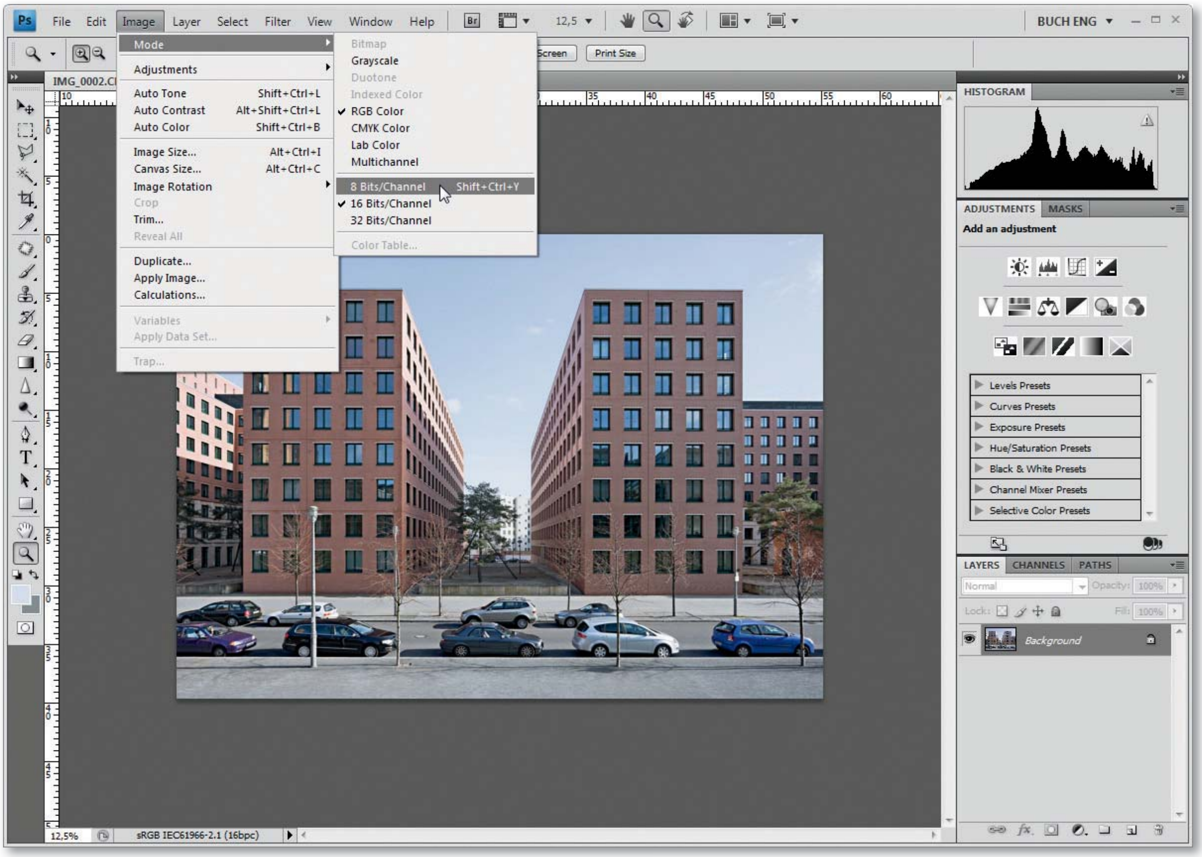


Figure 262

Figure 263: In comparison to the unedited image stored in the camera as JPEG file, the image version adjusted in Photoshop conveys an enhanced expression.

Summary: Image Corrections in Photoshop

- *Correcting pincushion and barrel distortion*
- *Correcting perspective projection distortion*
- *Adjusting brightness and contrast*
- *Reducing noise*
- *Balancing colors*
- *Optimizing contrast*
- *Sharpening*
- *Saving image file*

Exif Information

The Exif ("Exchangeable Image File Format") is based on a standard adopted in 1998. It is used in practically all modern digital cameras and defines how the various supplementary data sets relevant for the rendering of an image are integrated into the image data. Exif information is written into the so-called "header" of an image file. Therefore, they are embedded into data formats such as JPEG or TIFF. Exif data may include data such as shutter speed, aperture, time and date of the exposure, focal length, ISO setting, flash, white balance, and more. By reading the Exif information, a photographer may study the settings used for a particular shot, thereby gaining insights as to why the shot may have been unsuccessful. Many image management programs can directly access Exif data, and employ them to sort images and process them individually.

	EXIF
Dimensions	5616 x 3744
Cropped	5616 x 3744
Exposure	1/200 sec at ƒ / 10
Exposure Bias	2/3 EV
Flash	Did not fire
Exposure Program	Aperture priority
Metering Mode	Pattern
ISO Speed Rating	ISO 200
Focal Length	14 mm
Lens	EF14mm f/2.8L II USM
Date Time Original	26.04.2008 19:37:19
Date Time Digitized	26.04.2008 19:37:19
Date Time	26.04.2008 19:37:19
Make	Canon
Model	Canon EOS-1Ds Mark III

A part of the Exif information associated with a RAW file

4.3.2 In-Depth: Selective Contrast and Brightness Corrections

When processing architectural photographs, contrast and brightness corrections must often be done selectively. In other words, targeted darkening or brightening may be done in defined under- or overdeveloped areas of the image, or to balance out large contrast differences. We have already seen selective brightness correction via the color range selection (*Select > Color range*) as well as by painting on the layer mask of a brightened layer (section 4.3.1). There are other, highly effective methods for selectively brightening or darkening image areas. Among them are the *Shadows/Highlights* function (part of Photoshop CS1 and above), the application of a contrast mask, and special plug-ins such as LightMachine.

Workflow: Selective Contrast and Brightness Corrections

1. In our example, the large façade areas are too dark (figure 264). To correct this, we can use *Shadows/Highlights* in the *Image> Adjustments* menu. This function is well organized. The first stage shows only two sliders for *shadows* and *highlights*. Clicking on *Show More Options* opens more expanded selections (figure 265). To brighten dark image areas, use the sliders for *Amount*, *Tonal Width*, and *Radius* in the *Shadows* area of the dialog box. *Amount* controls the intensity of the effect. The optimal value varies from image to image, but it

Figure 264

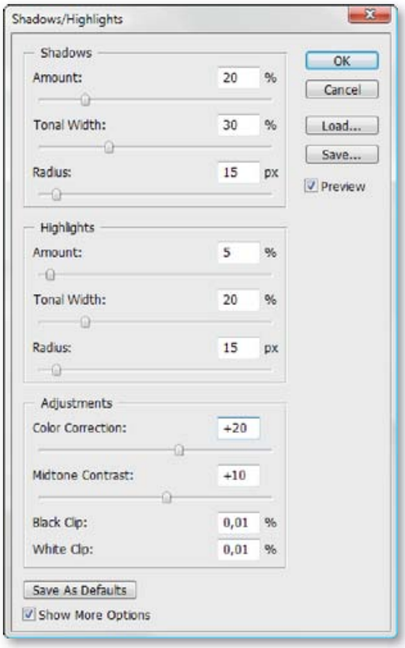


Figure 265

should not be set too high. *Tonal Width* determines which hue of shadow is affected by the process. Small values only have an effect on extremely dark areas; larger values also change brighter areas. A medium value is usually the best choice. *Radius* determines the size of the processed area surrounding the shadows. If the value is too small, there might be bright bands or halos; but if the value is too large, the effect only works on large surface areas. In addition, the slider for *Midtone Contrast* in the *Adjustments* area of the dialog box can restore the overall contrast if it has become diminished.

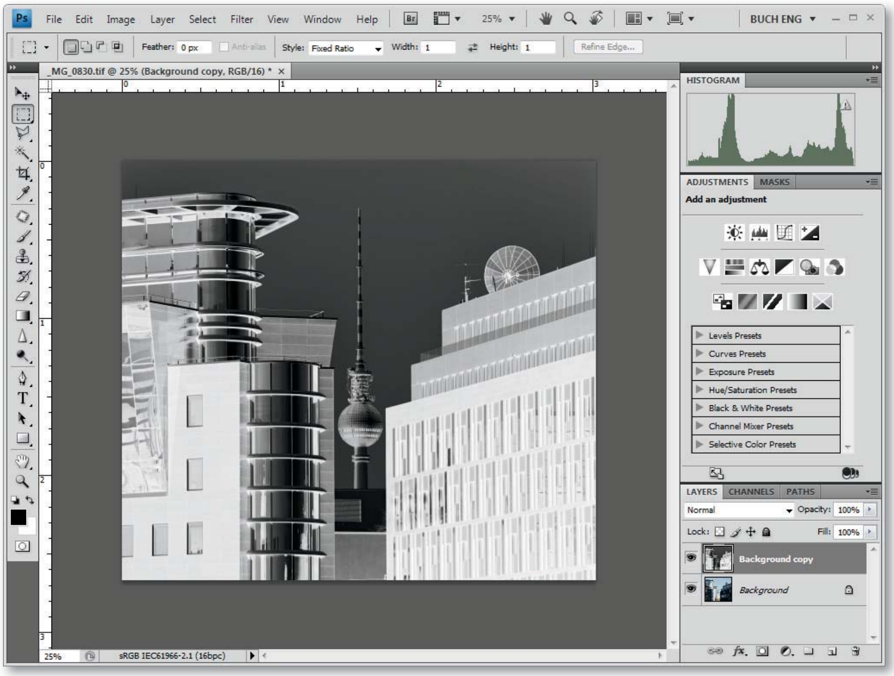


Figure 266

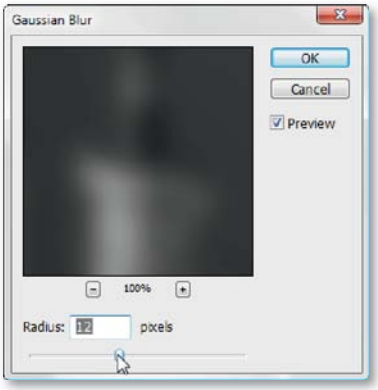


Figure 267

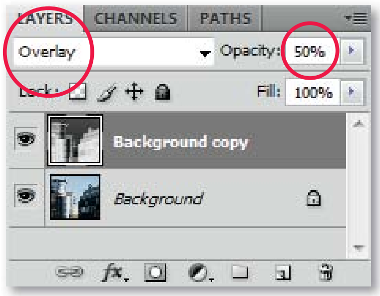


Figure 268

2. The application of a contrast mask is another useful procedure for brightening dark image areas. First, we duplicate the background layer (*Layer > Duplicate Layer*). Then we remove the saturation from the new layer by applying *Image > Adjustments > Desaturate* and changing the layer to a negative image using *Image > Adjustments > Invert* (figure 266). Afterwards, we apply *Gaussian Blur* from the *Filter > Blur* menu at a *Radius* of *5* to *15* pixels, depending on the size of the image (figure 267). In the final step, we set the layer under blending mode to *Overlay* while reducing the *Opacity* to a value from *30* to *50 %* (figure 268).

3. Add-on plug-ins generally work in similar ways, but they can be adjusted more exactly and therefore offer more options for making changes. One example is LightMachine (figure 269). It allows the selective brightening or darkening of highlights and shadows in *Shadows/Highlights* mode. In the *Auto Mask* window, minute adjustments to the respective image areas can be made so that no halos are produced and the image still maintains good contrast.

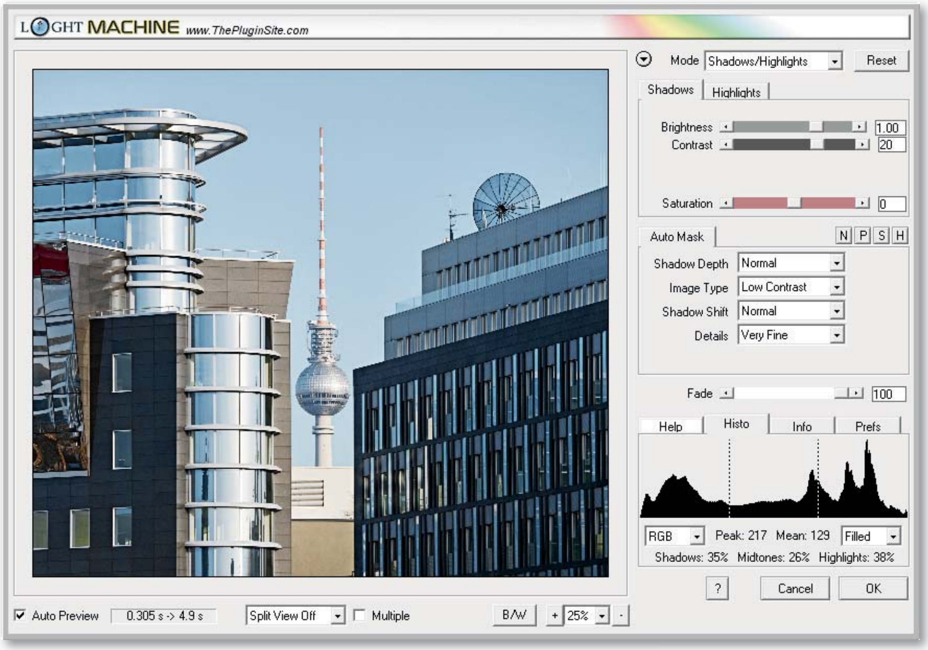


Figure 269

Figure 270: From top left, clockwise: unprocessed image; after application of depths-lights tool; after application of contrast mask; after processing with LightMachine

4.4 Panoramas

Combining several partial images into one single image is not done on a daily basis in architectural photography, but it is often useful in special situations. Panoramas can be assembled in different ways depending on the source material and the image concept. Spherical panoramas can be used for interactive presentations on a computer screen. Cylindrical panoramas can give a very wide overview of a building's surroundings and context; however, in architectural photography, the creation of rectilinear panoramas and panoramas with shift lenses and adapters is of greater importance, because they still follow the laws of central perspective and approximate the way a building is perceived by the human eye. For this reason, we deal with the practical workflow for these two types of panoramas. For those who want to immerse themselves more deeply in panorama photography, the book *Mastering Digital Panoramic Photography* by Harald Woeste, published by Rocky Nook, is highly recommended.

4.4.1 Rectilinear Panorama

Our first example consists of three images of the German History Museum in Berlin, which we will combine into a rectilinear panorama (figure 271). The images were shot with a handheld camera, without any additional technical aids, and with portrait orientation. Many software solutions are available to assemble the images in a process called "stitching". In this case, two different workflows for stitching the shots are described as we use the cross-platform freeware Hugin in combination with Autopano, as well as Photoshop's internal functions.

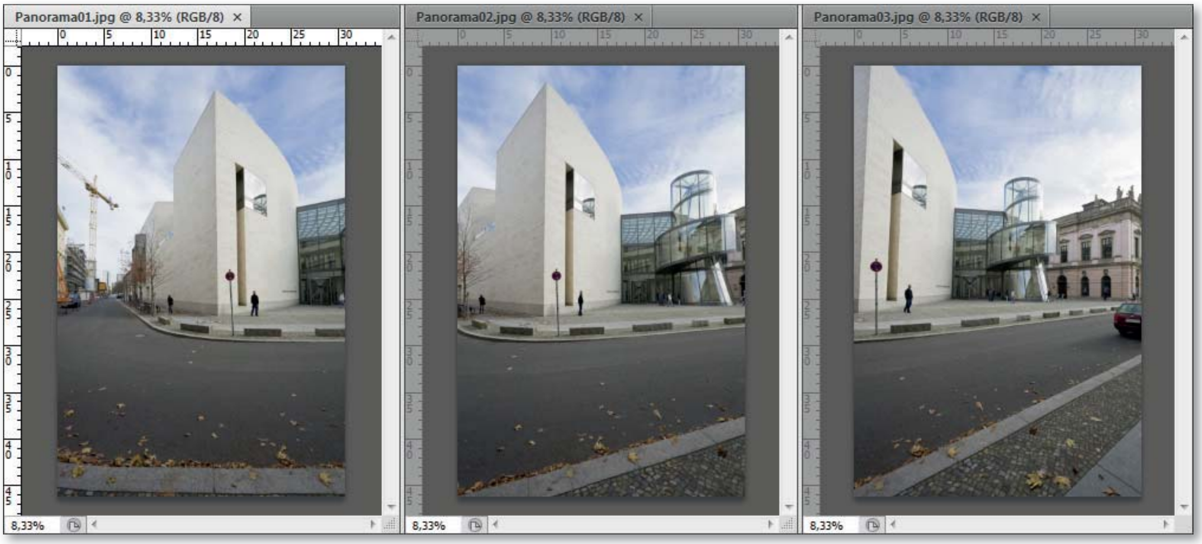


Figure 271

Workflow: Rectilinear Panorama with Hugin

1. Before we can work on images in Hugin, they must first undergo the usual RAW conversion. It is important to correct chromatic aberrations right away as it is virtually impossible to correct them later in the process. An exact distortion correction with tools such as PTLens or LensFix might also make sense, so that this does not have to be done in Hugin later. After these corrections are completed, the image should be saved in the lossless TIFF format or as a JPEG.

2. When we open Hugin for the first time, we go to the *Preferences* dialog box in the *File* menu and make a couple of changes: In the *Control Points Editor* palette, the checkmark should be set on *Enable rotation search* (figure 272); in *Autopano*, the option *Use alternative Autopano-SIFT program* should be activated (figure 273); and the program path should be selected. To achieve a flowing transition without brightness spikes, the *Enblend* tool which is already part of the Mac OS and Windows versions should be activated in the palette with the same name (figure 274).

3. Back in the main window, we avoid the automatic assistants and click on the *Images* palette (figure 275). Then we add our three images by clicking the *Add individual images* button (1). In the next step, we activate the middle image (2) and select *Anchor this image for position* and *Anchor this image for exposure* in the *Reference Image* area (3). Afterwards, we click on *Create control points* to automatically identify matching points in each separate image (4). We can also enter a value much higher than *10* under *Points per Overlap*.

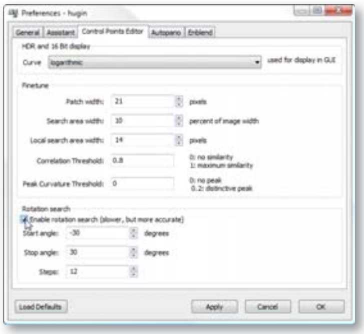


Figure 272

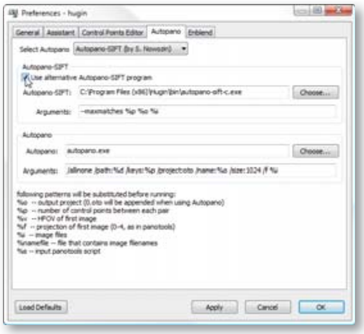


Figure 273

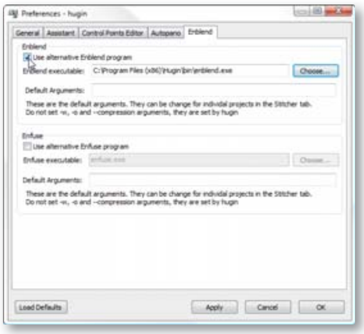


Figure 274

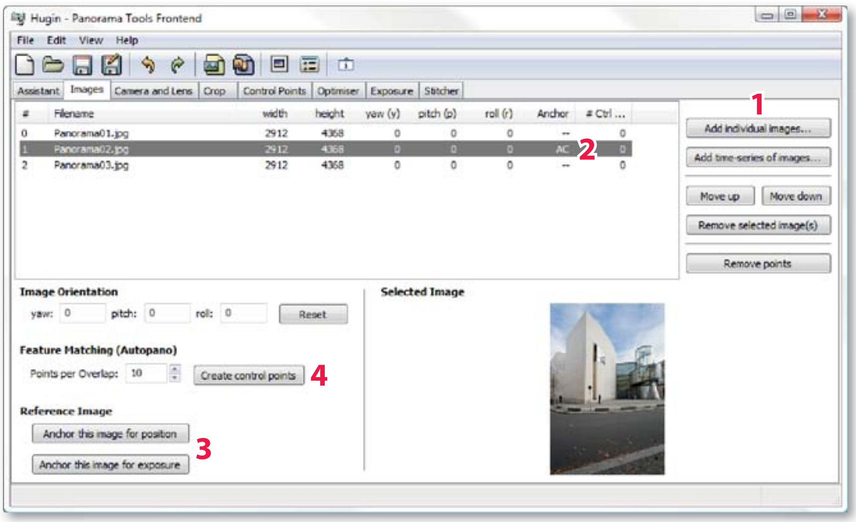


Figure 275

4. By bringing up the *Camera and Lens* palette, focal length and cropping information can automatically be calculated from the Exif data of the image (see page 182). If these values are not defined automatically, they can be added manually (figure 276). Because the images have already been corrected for vignetting and distortions, the more complex settings on the palette can be ignored.

5. In the *Crop* palette, our example does not require any changes.

6. The *Control Points* palette is of great importance for an exact stitching result. It defines specific identical points within all partial images. In our example, the software has found several such points, but they are all located in the central area (figure 277). This means that especially in the upper area, some points must be set manually. To accomplish this, we first enlarge a section of the image by clicking on the image at the right side of the wndow. Then we select a definitive point (in our case, the upper edge of the building) with

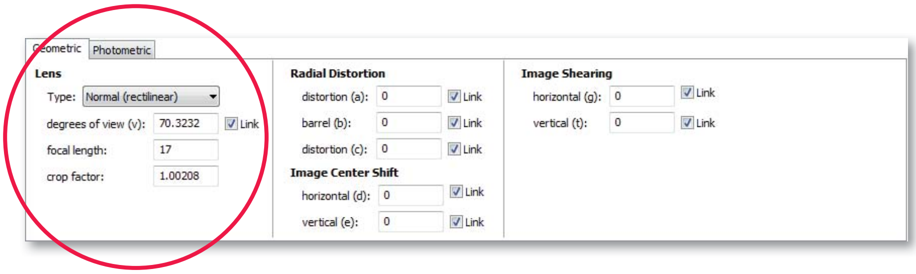


Figure 276

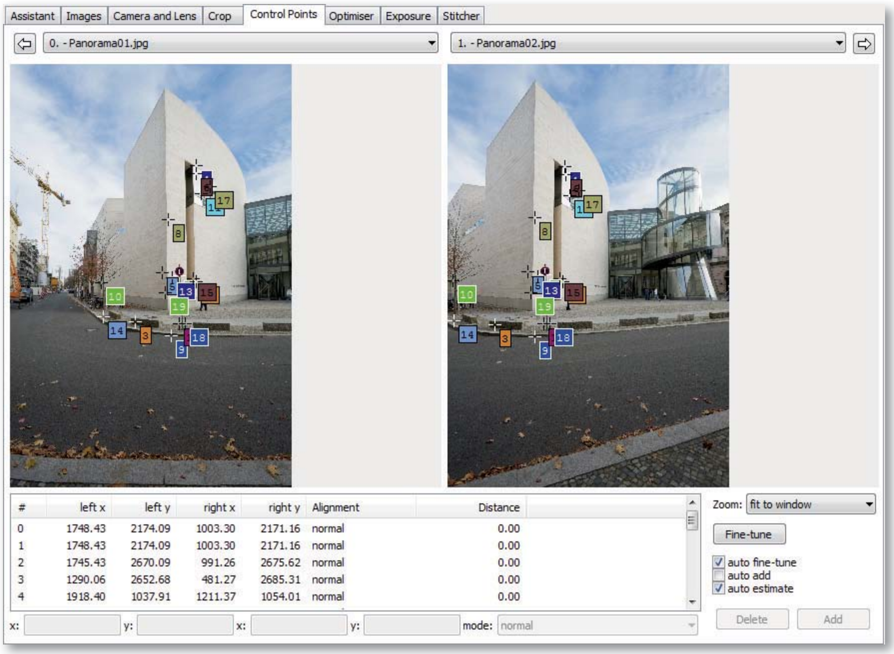


Figure 277

great precision (figure 278). The software automatically finds the corresponding point in the other images, though in some cases, a manual correction becomes necessary. Clicking *Add* confirms the point and puts it into the lower box section (figure 279). We repeat these steps several times until the control points are selected in all the important sections. In our example, the lower image area does not warrant much consideration, because it will be cropped later (figure 280).

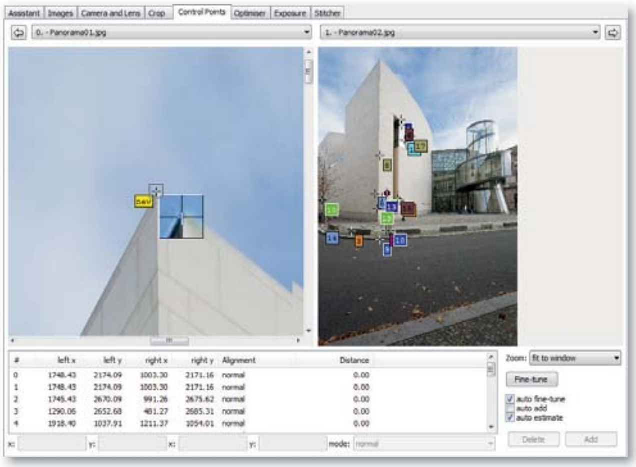


Figure 278

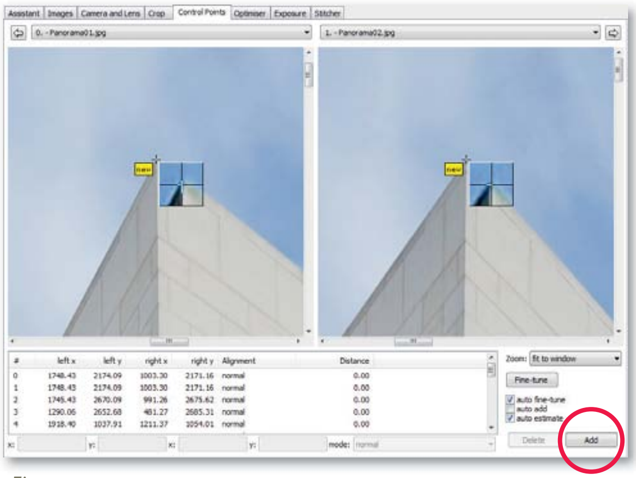


Figure 279

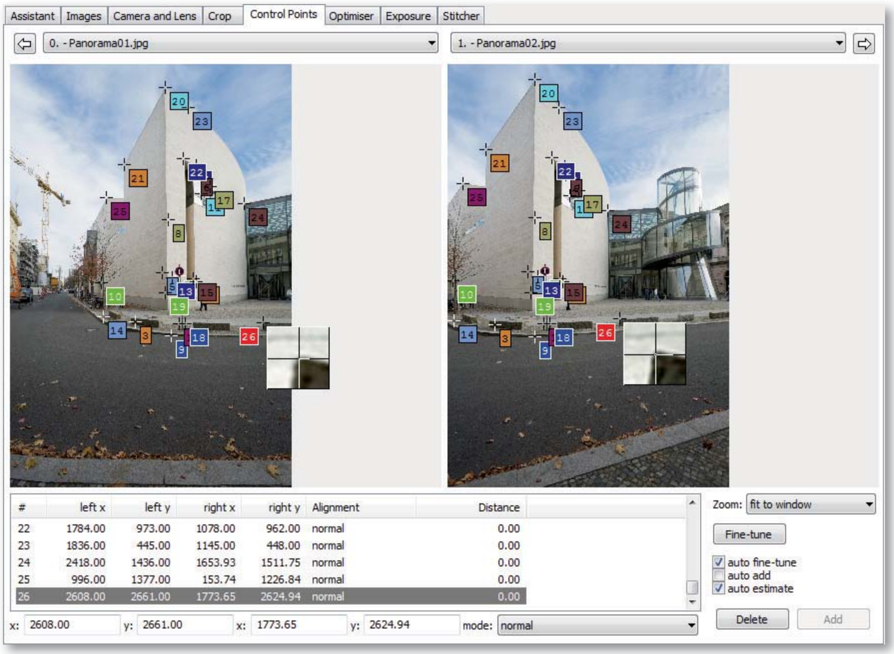


Figure 280

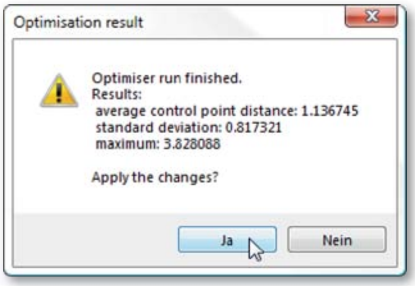


Figure 281

7. In the next menu, the software optimizes the image, taking all the control points into account. There are several ways of doing this; the best method can be found by trial and error. In our case, we select *Optimise > Positions (incremental, starting from anchor)* and press *Optimise now!*. The *Optimisation result* is quite good, considering that the shots were panned and taken handheld and the maximum control point distance was 3.828 pixels (figure 281).

8. It is good practice to open the panorama preview with the *View > Preview window* command (figure 282). Here, the image can be adjusted and aligned, and the panorama type can be selected. For a rectilinear panorama, we select *projection (f)* on *Rectilinear* (1). In some cases, the preview will be very small, which can be circumvented by choosing *Fit* (2). The sliders on the side and bottom also allow image magnification to be adjusted individually (3). The *Straighten* command button (4) performs its function automatically, but doing it manually is usually more exact. To do this, we just click on a point in the preview, ideally one in the middle of the compiled image and at the shooting height of the camera (here, at eye level) (5). This will almost entirely do away with converging verticals.

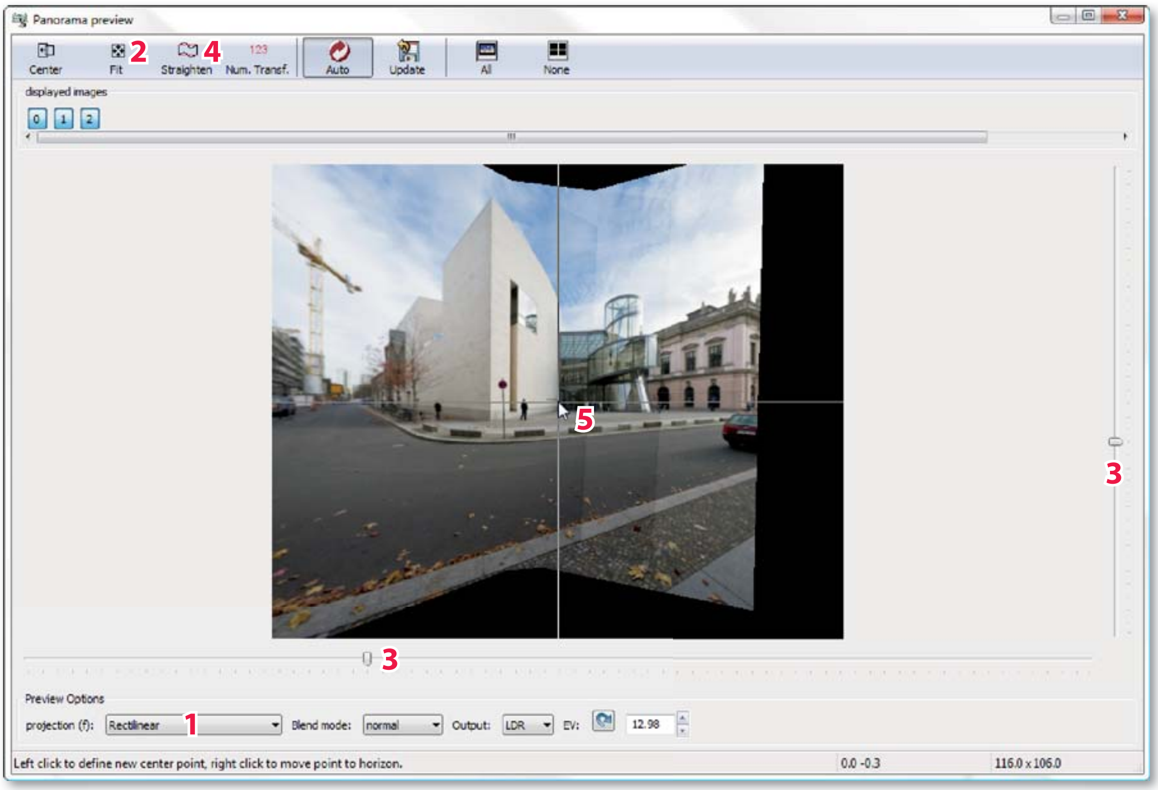


Figure 282

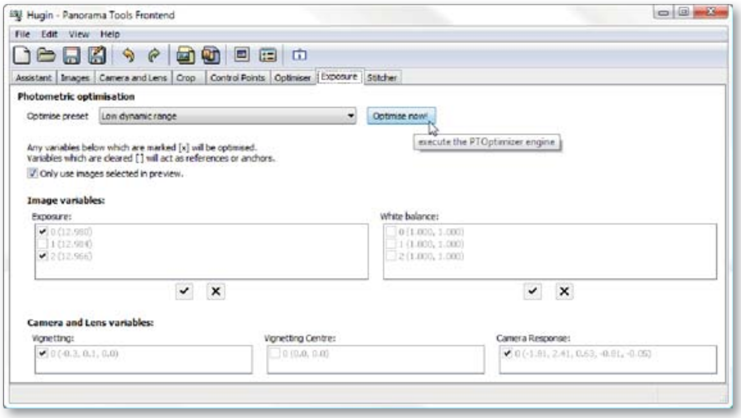


Figure 283

9. By selecting *Optimise preset > Low dynamic range* and *Optimise now!* in the *Exposure* palette, the software optimizes vignetting, the camera response curve, and exposure for all the photos (figure 283).

10. The final menu is called *Stitcher* (figure 284). We click the buttons in sequence: *Calculate Field of View* (1), *Calculate Optimal Size* (2), and activate *Blended panorama* in the *Output* area (3). Finally, we choose *File formats > TIFF* (4), select the *Stitch now!* command (5), and choose the appropriate file folder and file name. The panorama will now be compiled in full resolution.

11. After saving, we can open the image in an image-processing program such as Photoshop, crop it to the desired size, and make further adjustments.

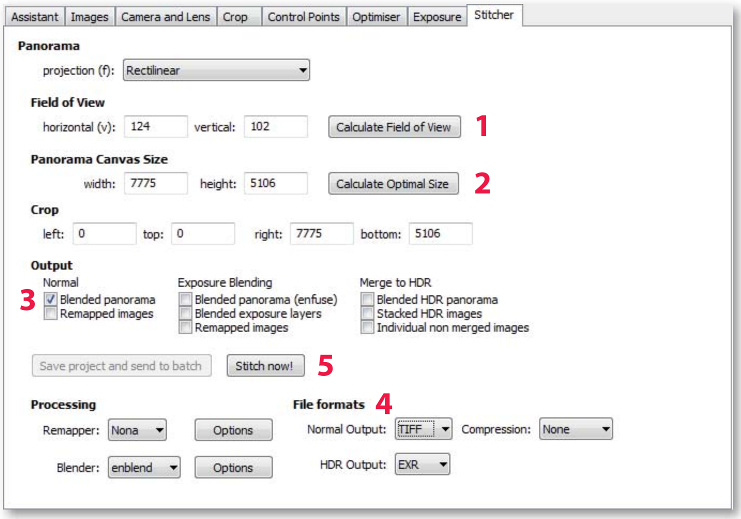


Figure 284

Workflow: Rectilinear Panorama with Photoshop

1. The workflow in Photoshop's panorama function is much less complex than the procedure in Hugin. The downside is that it offers fewer options. The panorama function can be found under *File > Automate > Photomerge*. The initial screen prompts the user to select the respective partial images. Unlike other panorama programs, Photoshop allows the direct use of RAW images. Before going this route, all adjustments should be made in the RAW converter, especially corrections for chromatic aberrations and vignetting. A conversion, however, is not necessary. Clicking the *Done* button in the RAW converter ensures that the changes are taken into account as part of the subsequent panorama workflow. After the files (in our case JPEGs) have been selected and the *Perspective* checkbox is activated in *Layout*, we initiate the assembly of the pictures by clicking *OK* (figure 285). This launches the automatic stitching process.

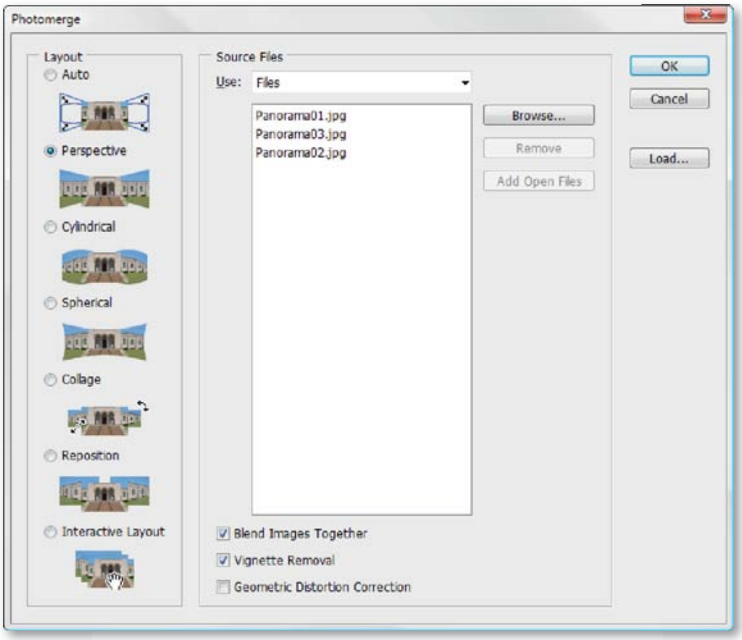


Figure 285

2. While Photoshop renders the assembled panorama in its entirety, the individual images are split into different layers. The advantage of this is that transitions can be corrected manually (figure 286). If the result of three or more partial images is uneven (for example, if one side is considerably more distorted than the other), it is important to do the initial image selection so that the middle image is on the bottom of the image selection (figure 287).

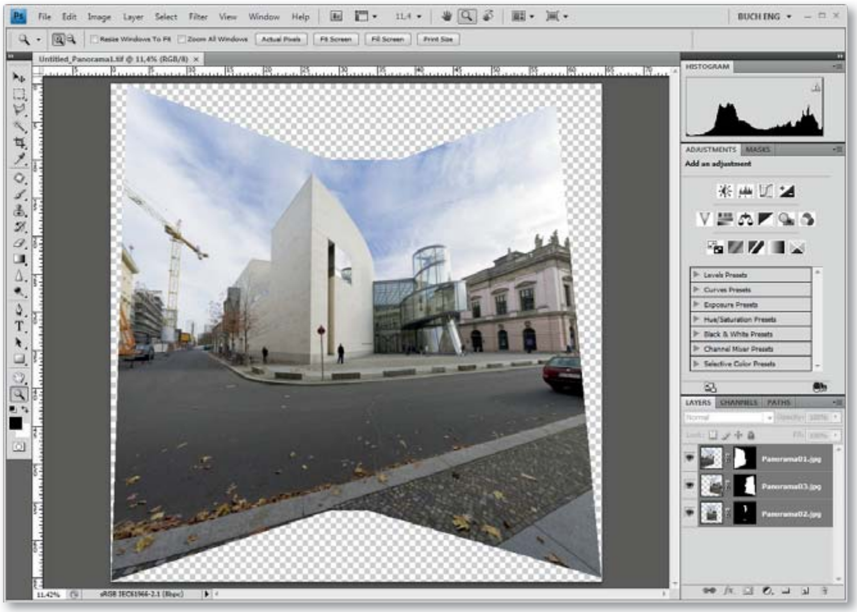


Figure 286

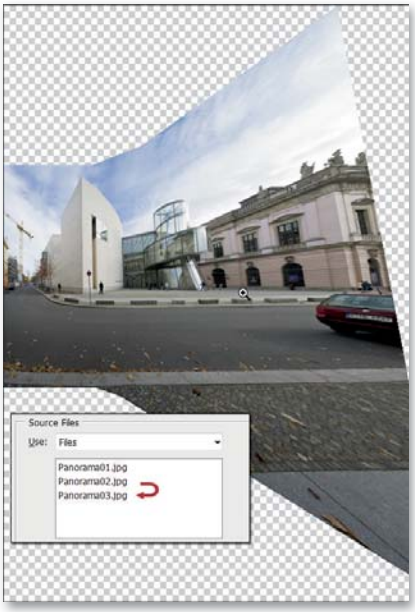


Figure 287

3. To remove converging verticals, we use the *Distort* and *Perspective* functions in the *Edit > Transform* menu. Turning on the grid or rulers from the *View* menu assists with maintaining the proper orientation (figure 288).

4. As a final step, we can choose the ideal image frame with the *Crop tool* (figure 289) and make individual brightness, color, and sharpness corrections (see figure 118, page 86).

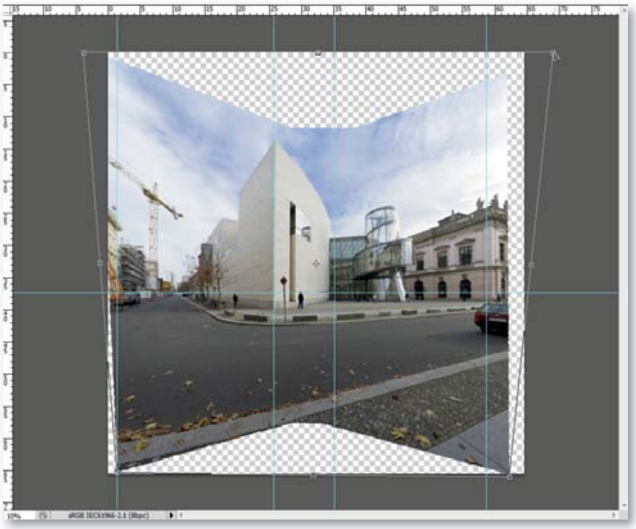


Figure 288

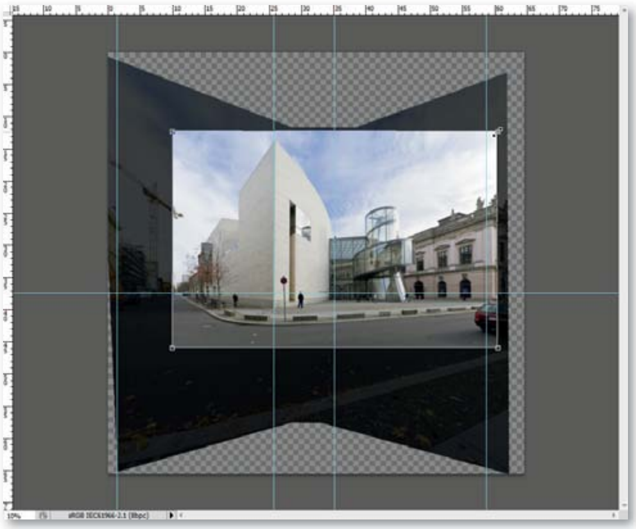


Figure 289

4.4.2 Shift Panorama

Panoramas done with a shift lens consist of partial images taken from an identical viewing direction. With regular shift lenses, the slightly shifted light path produces a very slight difference in perspective. Above a certain distance to the subject, this is of little significance. Some shift adapters can even produce perfectly matching transitions because the adapter and lens, rather than the camera, are connected to the tripod (see figure 120, page 87).

Workflow: Shift Panorama with Photoshop

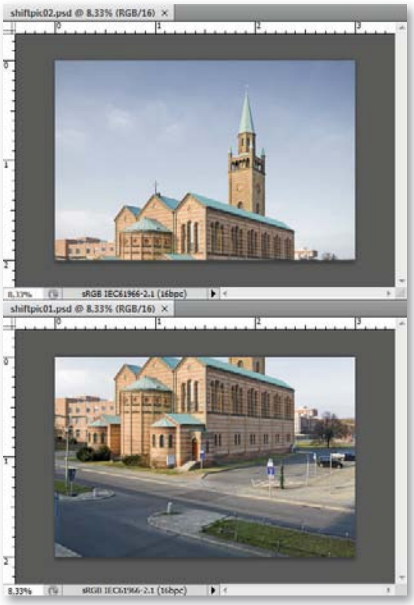


Figure 290

1. We took these two sample images with a shift lens and differing vertical shift. Because we pointed the lens precisely at the horizon, there are no converging verticals. After the RAW conversion process with identical settings, we open the partial images in Photoshop's main window (figure 290).

2. To expand the upper image downward, we select the *Layer > New > Background From Layer* command and open the *Canvas Size* dialog from the *Image* menu. Then we select the unit *percent*, and define *Height* with a value of *200*. In the *Anchor* area we activate the upper middle square; this expands the workspace downward (figure 291). Clicking *OK* sends us back to the main window.

3. In the next step, we activate the *Move tool* and switch to the lower partial image. Then we drag it into the upper image while holding down the left mouse button (figure 292). Now that both images are combined into one file, we continue to work with the image containing the layer composition and close the remaining source file.

4. In Photoshop CS3 and above, images can be automatically positioned against each other. To do this, we select both layers while holding down the shift key, then choose *Auto-Align Layers* from the *Edit* menu (figure 293). We keep the *Auto* setting and click *OK*. This sequence causes Photoshop to position each layer side by side, just like in a rectilinear panorama. Then we can use the *Auto-Blend Layers* command to adjust slight brightness differences between the two partial images automatically. After selecting the command, a dialog box is displayed. Activate the option *Panorama* and confirm with *OK*. Of course, all this can be done manually instead, with somewhat more work. To do this, we would first select the 100% view, change the upper layer to *50%* opacity, and stack the images using the *Move tool*. The transparency makes it possible to match

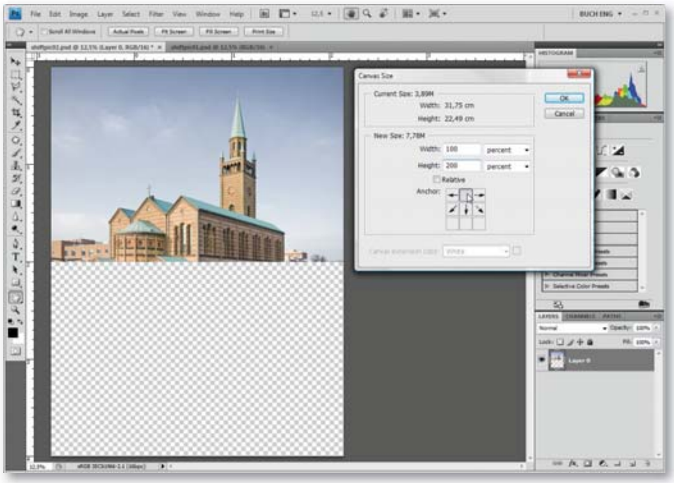


Figure 291

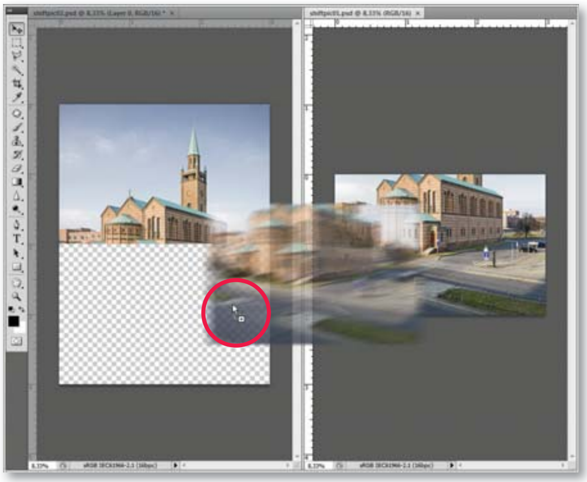


Figure 292

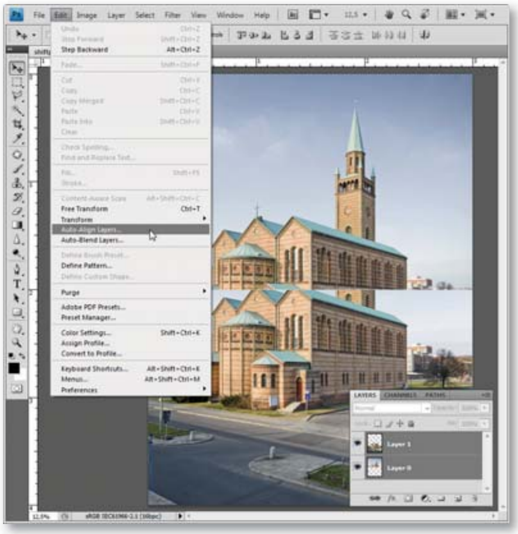


Figure 293

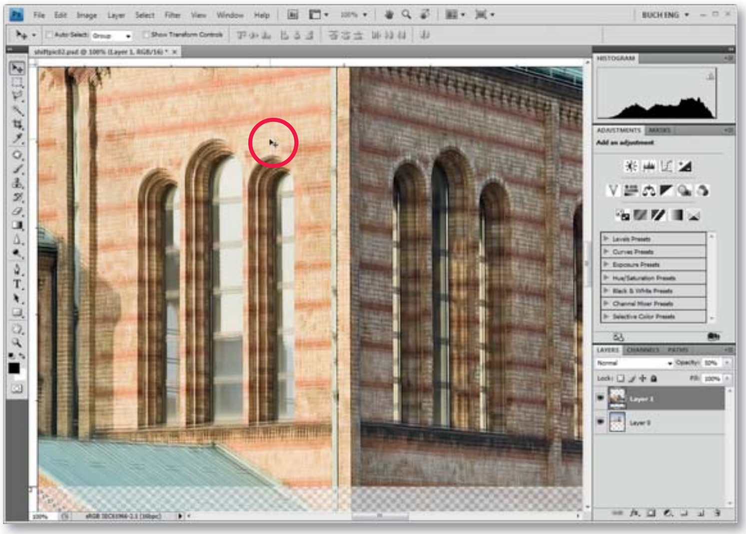


Figure 294

identical structures precisely, and the keyboard's arrow keys can be used for minute adjustments (figure 294).

5. In the next step, we manually create the transition borders between the two partial images. This method generally makes sense because differences in brightness and even the slightest misalignments show up best when the images transition straight into each other. Even with shift lenses and identical exposure parameters, partial images with slight differences of brightness cannot be completely avoided because of small lighting changes on

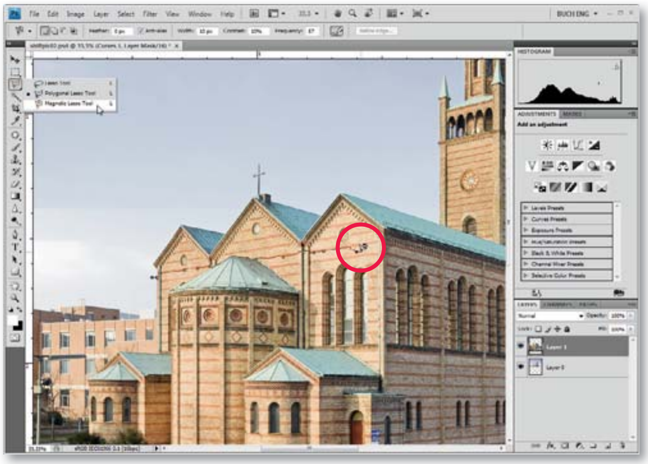


Figure 295

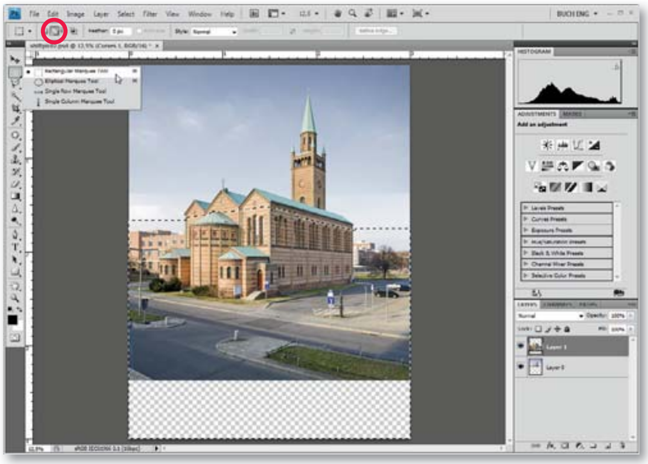


Figure 296

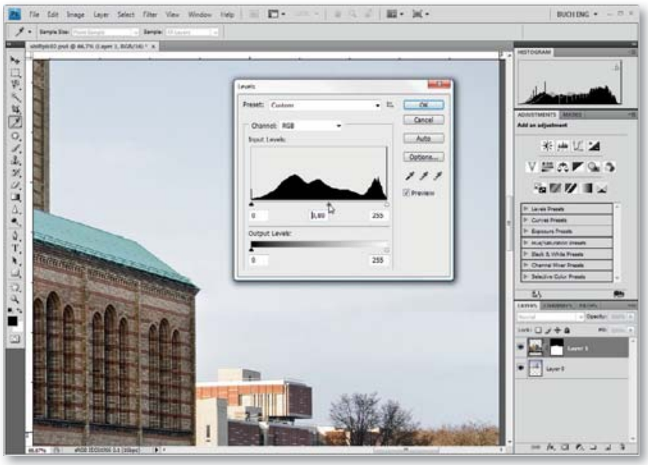


Figure 297

the subject caused by clouds, light scattering, or reflections. Slight misalignments can also arise from a slightly altered optical axis during the shifting process, or from small vibrations during the movement of the shift slide. The transition border is created with a layer mask and therefore can be changed at any time. On images with lots of details (like our sample) the *Polygonal Lasso tool* works best. The *Magnetic Lasso tool* is even simpler to use; it creates a selection based on the contrast-rich image structures (figure 295). Afterwards, we can perfect the selection by using the *Rectangular Marquee tool* while holding down the shift key (*Add to selection* mode), until the selection area (which should be taken from the upper layer) is completely captured (figure 296). By clicking *Add layer mask* (see Figure 241, page 172), we produce a borderline matching the internal structures of the image. It should run through the image unobtrusively. After activating the respective layer thumbnail image, the brightness can be synchronized with *Levels* or *Curves* in *Image > Adjustments* (figure 297). To further perfect the image, we can apply the *Burn tool* or the *Dodge tool* with a large *Master Diameter*. This allows the precise darkening or brightening of selected sections with a low value under *Exposure* (figure 298). In large, even sections (such as the sky), the layer mask should also be softened with a broad brush and minimal *Hardness*, as our example demonstrates (figure 299). This makes the image transition practically invisible.

6. After choosing the ideal image frame with the *Crop tool* (figure 300) and flattening the image to one background layer (*Layer > Flatten Image*), we can proceed with the usual processing workflow (see Illustration 119, page 87).

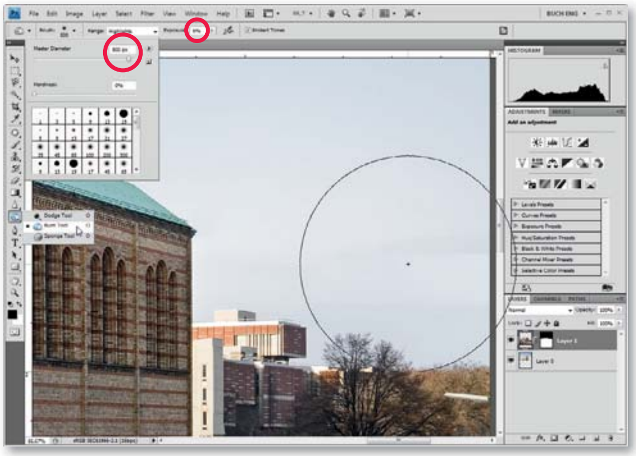


Figure 298

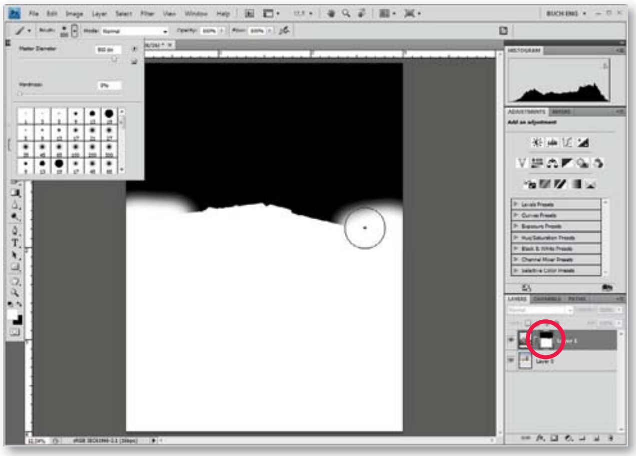


Figure 299

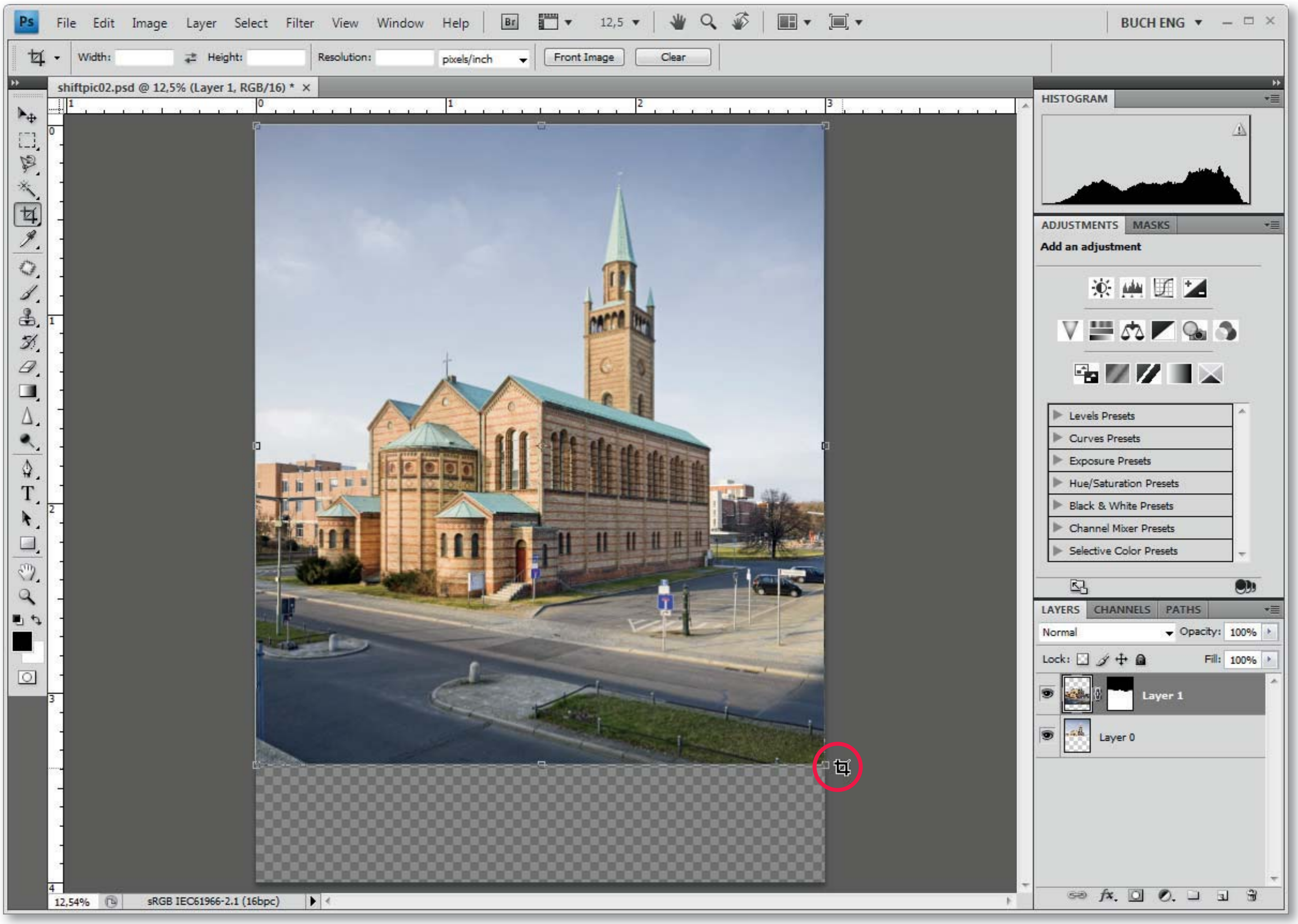


Figure 300

4.5 HDR and DRI Images

The raw material for HDR and DRI images consists of several images with the same frame but different exposure settings. There are several procedures that can be used to combine these exposure brackets into a single image with an expanded contrast range.

The HDR technique combines several shots into one 32-bit HDR image with an extremely high contrast range. "Tone mapping" then transforms the image into a format used for printing and presentation on a computer monitor. The simpler DRI method combines the exposure bracketing sequence by dissolving them into each other without the conversion of color depth.

Many autonomous software solutions are available to combine the exposure brackets. We will demonstrate a procedure on the Photomatix Pro application from HDRsoft. This program can process both HDR and DRI images. We will also show a procedure for using Photoshop to apply a manual DRI workflow. Since the CS2 version, Photoshop is also capable of HDR processing in 32-bit mode.

4.5.1 HDR with Photomatix Pro

Figure 301

Photomatix Pro can open some RAW formats directly, but it is better to convert exposure brackets from RAW format into 8-bit or (better) 16-bit TIFF files (figure 301). This is because corrections such as the reduction of aberrations can no longer be done as precisely after the HDR conversion.

1. We begin the workflow by clicking *Generate HDR image*. In the newly opened dialog box, we select the images and click *OK* (figure 302).

2. Even if the images were not handheld shots, but rather made from a tripod, it makes sense to check the options *Align source images > By matching features* and *Ghosting reduction settings > Background movements* in the next window. If objects such as tree branches have moved slightly, the option *Ghosting reduction settings > Moving objects/people* can be highly effective. Larger movements by people or vehicles between exposures cannot be corrected entirely. Next, we close the dialog box by clicking *OK* (figure 303).

3. After the conversion, the HDR image opens in a new window. It will appear quite strange because the complete tonal values of an HDR image cannot be rendered due to the computer screen's limited dynamic range. The HDR viewer can be used for spot-checking the alignment of the merged images and give a preview of the potential end result (figure 304).

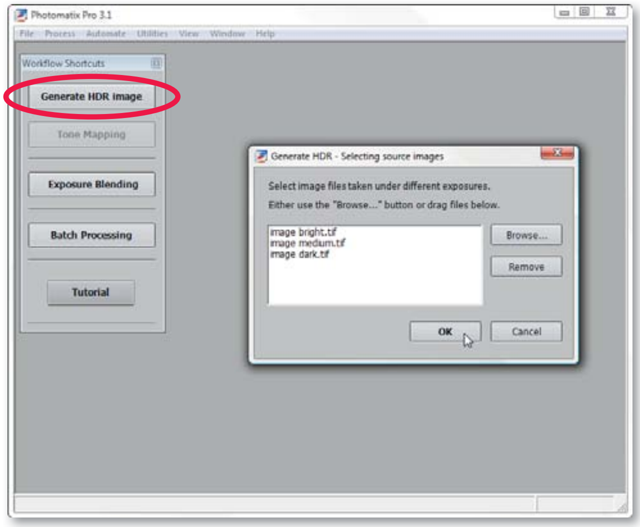


Figure 302

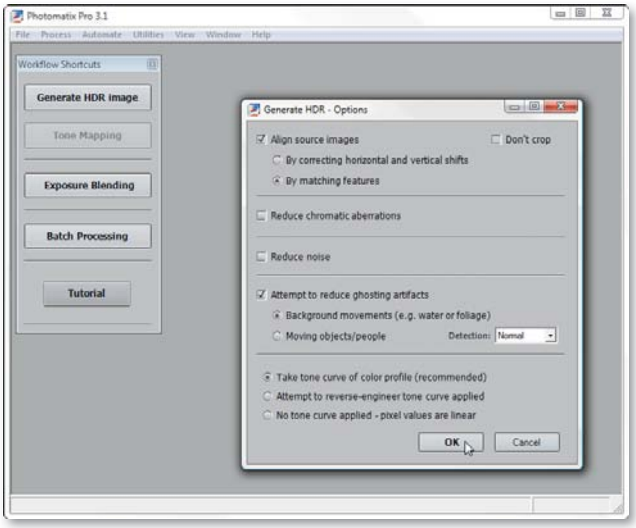


Figure 303

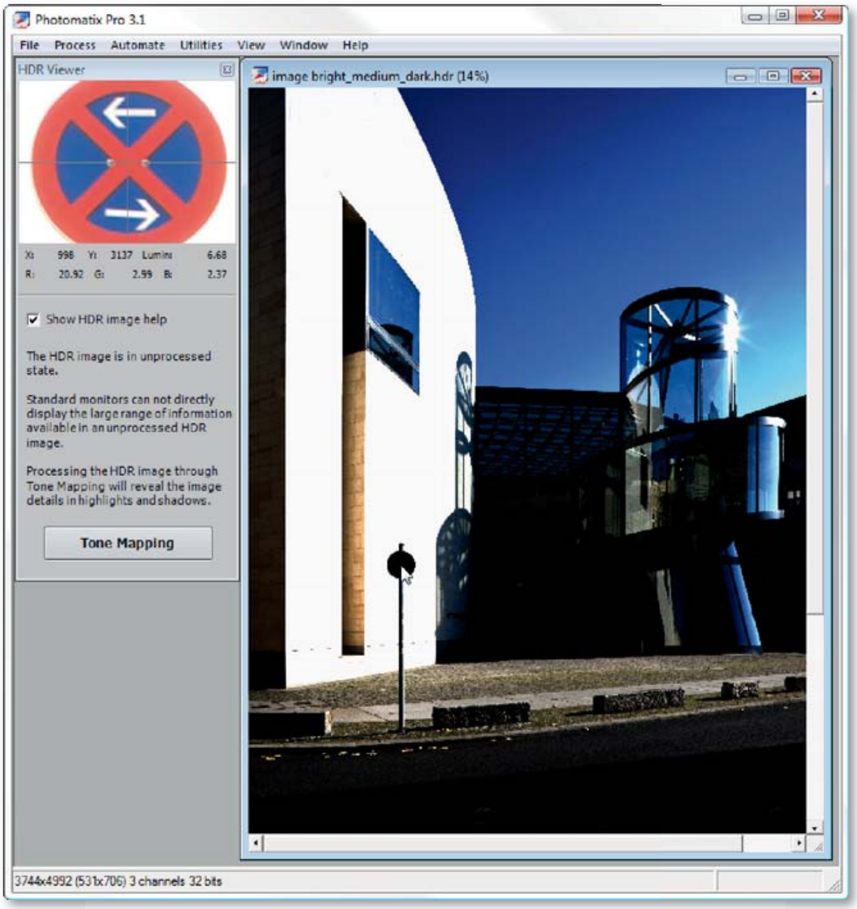


Figure 304

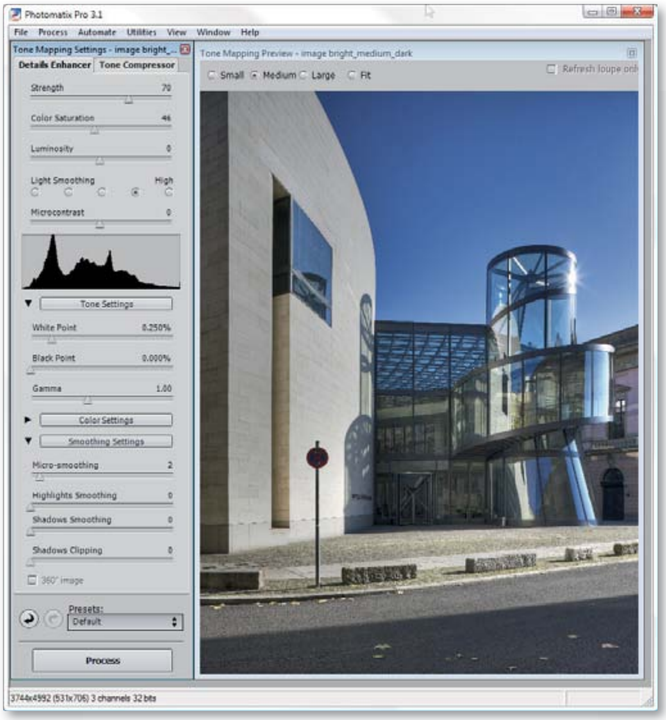


Figure 305

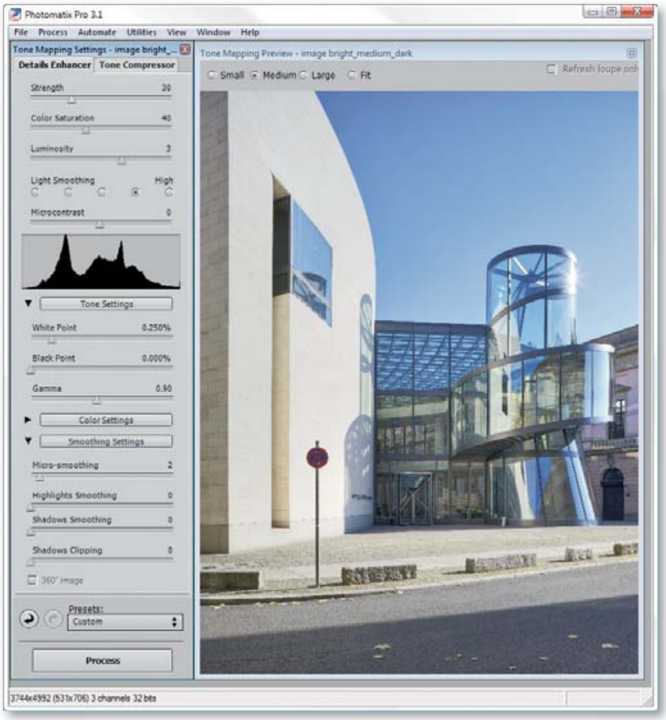


Figure 306

4. From the *Tone Mapping* tab we arrive at the tone mapping dialog box. Here, Photomatix Pro offers two options: the slightly more complex *Details Enhancer*, which often yields the best results, and the simpler but quicker *Tone Compressor*. On the left side of the dialog we find the relevant sliders that control the dynamic compression result. After we choose *Details Enhancer*, the standard settings lead to a somewhat dark presentation in our example (figure 305). We compensate for this with the *Luminosity*, *White Point*, and *Gamma* sliders. To achieve a realistic looking image, the value for *Strength* should not be made too high. Although we do not change them in our example, other important sliders include *Black Point*, *Light Smoothing*, and the slider in the *Smoothing Settings* submenu (figure 306). The optimum settings differ drastically from image to image. Therefore, only experimentation can lead to the perfect result. In our case, the goal of tone mapping is not to produce a final image with dramatic effects, but rather an image with a balanced histogram. This approach delivers the ideal raw material for further processing in Photoshop. Finally, we click on *Process* to apply the tone mapping process to the image.

5. After the tone mapping is completed, the final image is displayed in the main window. By using the *File > Save As* command, we can save the image for further processing in Photoshop or in other image processing software.

6. In some cases it is a good idea to make a second HDR version with the *Tone Compressor* method to have a comparison between the two. To do this, we click on *Process > Undo Tone Mapping* and repeat the tone mapping with *Tone Compressor* (figure 307).

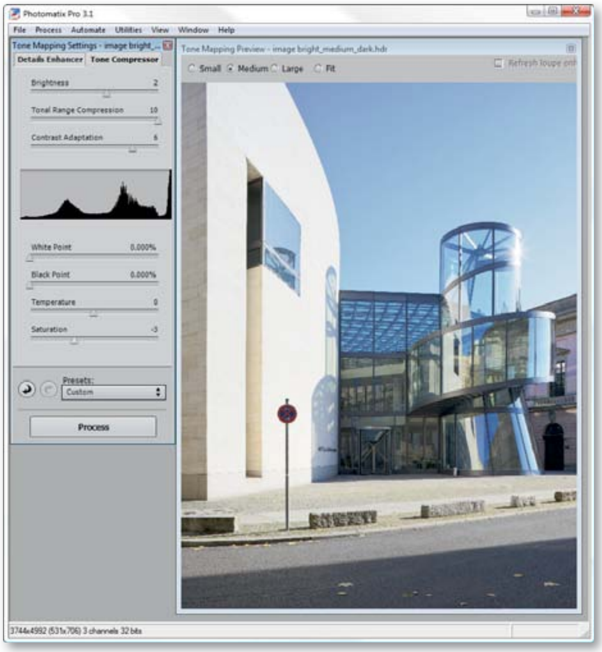


Figure 307

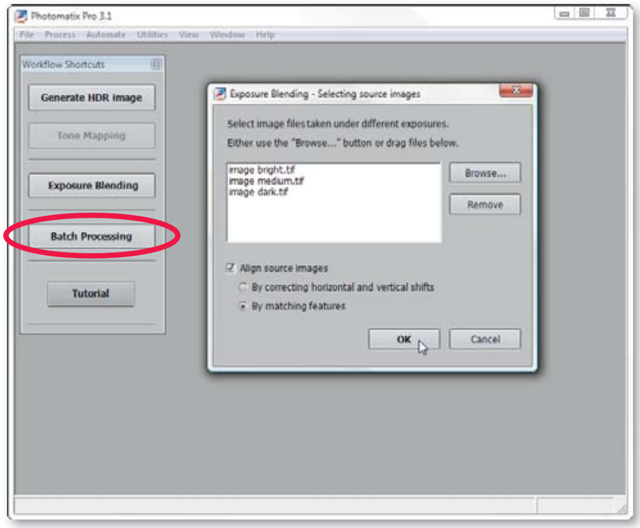


Figure 308

4.5.2 Workflow: DRI with Photomatix Pro

The DRI function in Photomatix Pro is relatively simple. Using the existing highlight and shadow details from the source images, it calculates a new image with expanded contrast range. This process does not change the color space or color depth. No HDR files are created.

1. In the first step, we click on *Exposure Blending* before selecting the images from the exposure bracketing sequence in the next window. At this point, it makes sense to check the option *Align source images > By matching features* (figure 308).

2. Clicking *OK* takes us to the next window. Here we activate *Highlights & Shadows - Adjust* (figure 309). This allows us to move the sliders for options like *Accentuation*, *Blending Point*, and *Color Saturation* individually. To see the results of these settings, we can use the magnifying glass to toggle between detailed and overall views. We then combine the images by clicking the *Process* button.

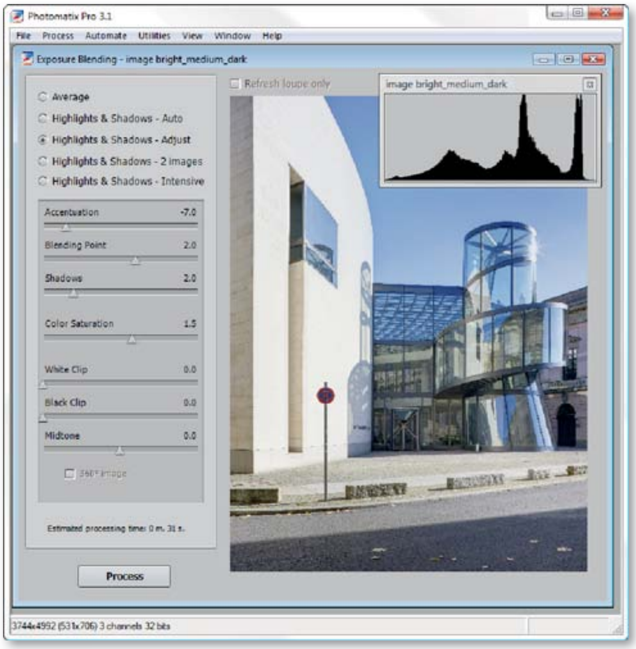


Figure 309

4.5.3 Workflow: HDR with Photoshop

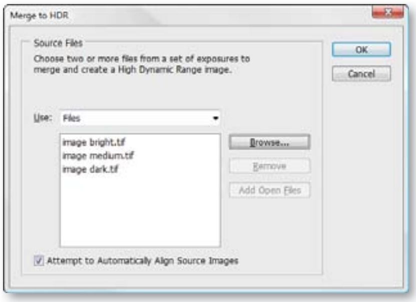


Figure 310

1. Photoshop's HDR tool is hidden in the *File > Automate* command path where we locate *Merge to HDR*. In the dialog box, we choose each file from the exposure bracketing sequence. In the Photoshop environment, we can choose all RAW formats supported by Adobe's ACR converter. We import the RAW images after optimizing them in the RAW converter. This offers two advantages: the adjustments made in the RAW converter are integrated into the images, and we gain the best possible source material for processing. Of course, we can also make HDRs from other image formats, such as the TIFF format used in our example (figure 310).

2. After we click *OK*, the conversion process runs automatically. While it is in progress, a preview window opens (figure 311) that gives us thumbnail views of each shot on the left side and shows the exposure levels based on Exif information (see page 182). We can eliminate images by unchecking their checkmarks. The *White Point Preview* slider simplifies the assessment of all tonal areas and matches the brightness levels with the central preview image. However, the value chosen here only changes the HDR preview on the screen and has no bearing on the actual contrast range of the HDR image.

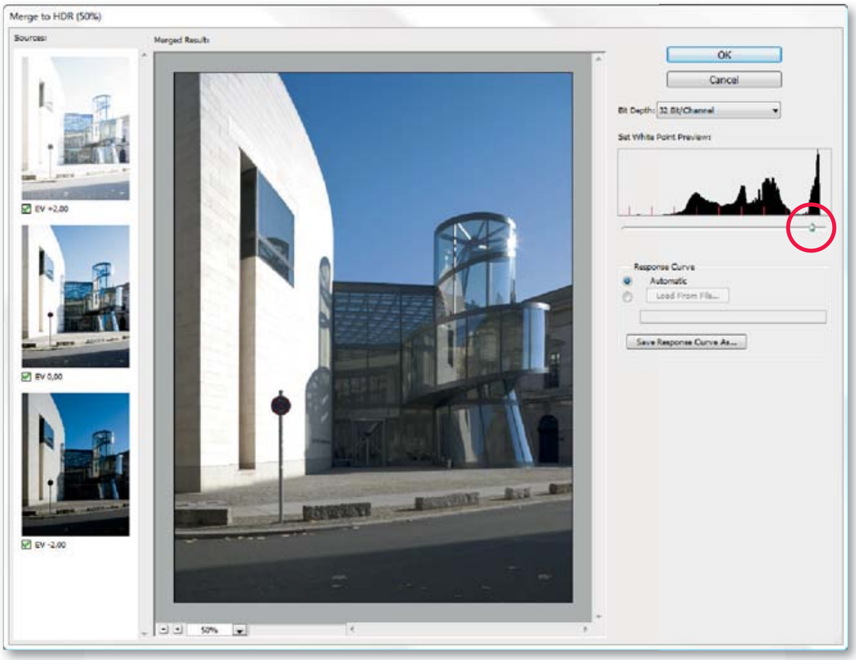


Figure 311

We must keep in mind that just like in Photomatix Pro, the screen image only shows a limited spectrum of the total range of contrasts in the 32-bit file. The choice of *Bit Depth* is very important for the successive workflow. If you choose either *8 Bit/Channel* or *16 Bit/Channel*, a new dialog box called *HDR-Conversion* is displayed. If we choose *32 Bit/Channel*, however, the transformation process ends at this point. The HDR image can now be saved and undergo more processing later. In this case, to get back to the *HDR-Conversion* dialog box, the command must be executed via *Image > Mode > 8 Bits/Channel* or *Image > Mode > 16 Bits/Channel* (figure 312).

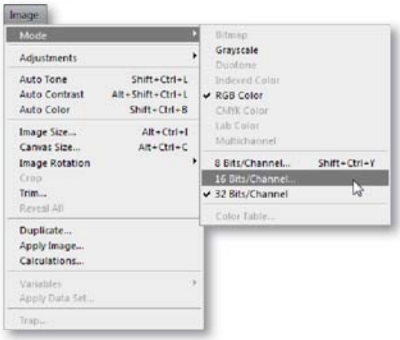


Figure 312

3. The *HDR-Conversion* dialog box offers several automated and manual methods for dynamic compression. *Local Adaptation* is the most flexible. There are no universal values for *Radius* und *Threshold*, but the settings used in our example often work well. The alignment of the toning curve with the HDR histogram is very important. First, we expand the window by clicking the corresponding icon. Then, we slide the demarcation points of the toning curve along the beginning and end areas of the histogram peaks as demonstrated in our example. A soft S-curve increases the overall contrast. We then click *OK* and move on to further processing steps (figure 313).

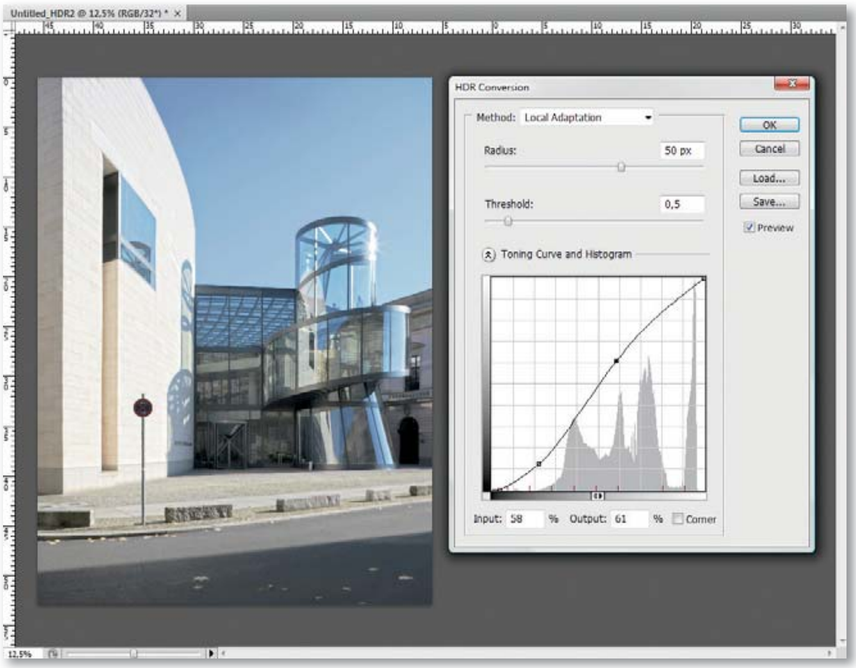


Figure 313

Figure 314

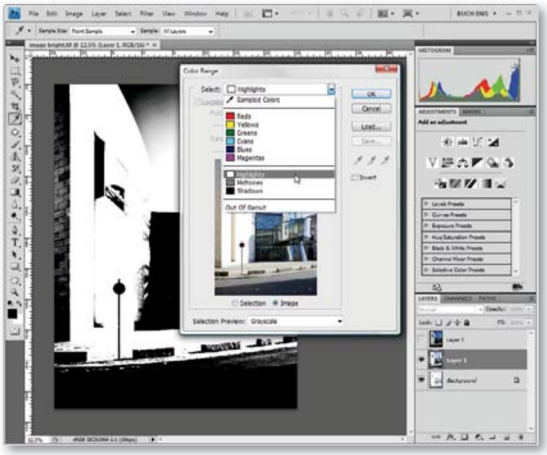


Figure 315

4.5.4 Workflow: DRI with Photoshop

1. Photoshop does not explicitly offer a DRI function, but there is a way to manually combine exposure brackets. First, we open each of the exposed images and move them as seen in our example with the *Move tool* on top of the brightest shot (figure 314). We then organize the newly created layers in the sequence of exposure.

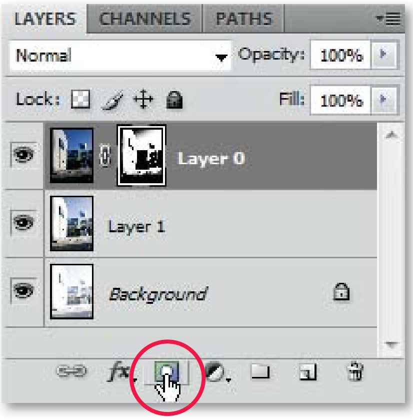


Figure 316

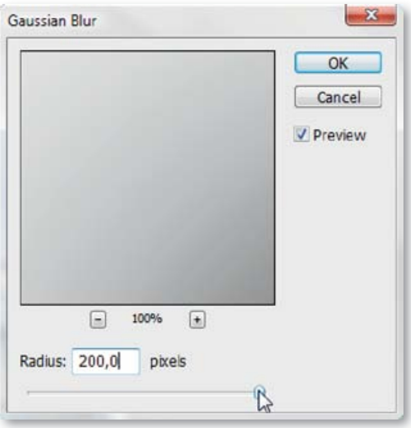


Figure 317

2. We make the top layer (the darkest image) invisible by clicking on the eye symbol and activating the layer underneath. With the *Select > Color Range* command and subsequent activation of *Select > Highlights* we can create a selection encompassing only the bright areas of the middle image (figure 315).

3. After activating and showing the upper layer thumbnail, we apply the selection to the image by clicking *Add layer mask* (figure 316). Surfaces that appear black in the layer mask lead to a transparent representation of the corresponding image area. The areas appearing white remain visible in the image.

4. Using *Gaussian Blur* from the *Filter > Blur* menu, we soften the layer mask. Depending on the size of the image, we choose between *100* and *250* pixels (figure 317). Since Photoshop CS4, an even better technique is provided by the *Refine Mask* command (*Select > Refine Edge*) using the *Feather* slider (figure 318).

5. Then we repeat the same procedure (steps 2-4) with the next layer (the middle image). To do so, we make all layers invisible except the background layer (figure 319), activate the background layer, and select *Highlights* in the *Color Range* window. This selection is then applied to the middle layer and then softened.

6. Next, we set the opacity of the middle layer to *66%* (figure 320) and the top layer to *33%*. (These values are only approximations.) The ideal settings can vary greatly from subject to subject.

7. Because the blurring of the layer masks creates small halos in the transition zones between both detailed areas and large untextured areas, as well as between dark and light surfaces, the affected areas should be corrected with a very soft brush. We can do this by drawing in the active layer mask with a white brush, which eliminates the halos (figure 321).

8. To make further enhancements at this point, it is possible to experiment with various fill methods, such as *Multiply* (figure 322).

9. Finally, we compile all the layers into one background layer with *Layer > Flatten Image* and perform further processing in the usual manner.

Figure 318

Figure 319

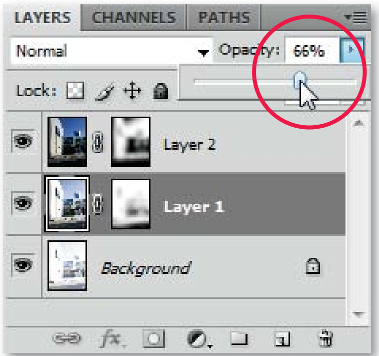


Figure 320

Figure 321

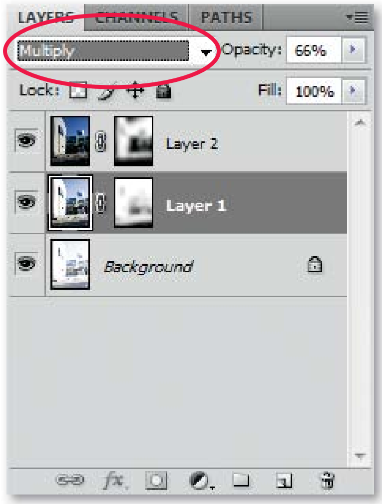


Figure 322

4.6 Creativity Tips

The sections below demonstrate how digital processing can be used to make creative enhancements to images.

4.6.1 Digital Graduated Neutral Density Filter

An optical graduated neutral density filter actively reduces the light falling on the film or image sensor. The digital version is not as effective, since it is only a simulation using Photoshop; however, it is still a very useful tool, and because it works as its own layer, it can always be removed.

To produce the effect digitally, we first select deep black as the foreground color in Photoshop (figure 323). After that, we create a new fill layer by using the *Layer > New Fill Layer > Gradient* command path and click *OK* in the next dialog box. (Alternatively, we can click on the *Create new fill or adjustment layer* icon in the layer palette and then select *Gradient*, figure 324.) Next, the *Gradient Fill* dialog box pops up which requires some adjustments. In the *Gradient* menu, a gradient from black to transparent should now be displayed (figure 325). A double-click leads to another dialog box (*Gradient Edi-*

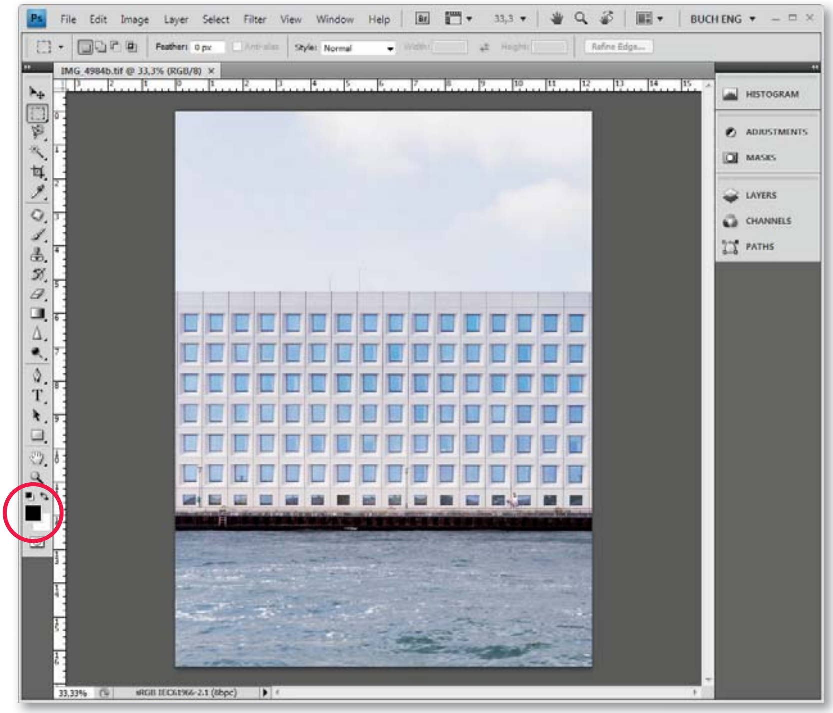


Figure 323

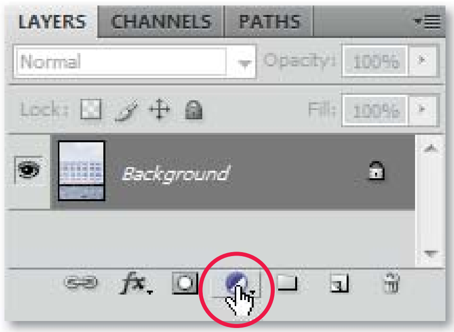


Figure 324

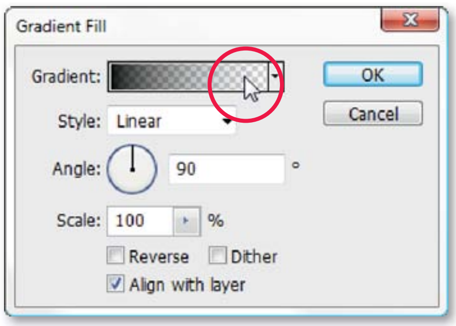


Figure 325

tor) that allows for individual adjustments. Here, we activate the adjuster in the upper right preview (as seen in the example) and set a value of *60* in the *Location* field (figure 326). A click on *OK* returns us to the *Gradient Fill* window. Here, in the *Style* dropdown, we select the setting *Linear*; in the *Angle* drop-down we select a value of *90*; in the *Scale* window, we enter the value *100*; and lastly, we check both the *Reverse* and *Align with layer* boxes (figure 327). After we set all of these parameters, we return to the workspace by clicking *OK*. Then we set the fill method for the fill layer to *Soft Light* (figure 328). With this step, the digital filter is deployed successfully. Individual adjustments can be made at any time by double-clicking on the layer thumbnail. To avoid performing these steps manually for every image, we can set up an *Action* (*Window > Actions*) in Photoshop to automate the process.

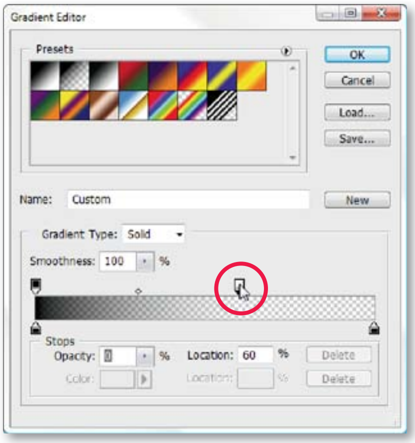


Figure 326

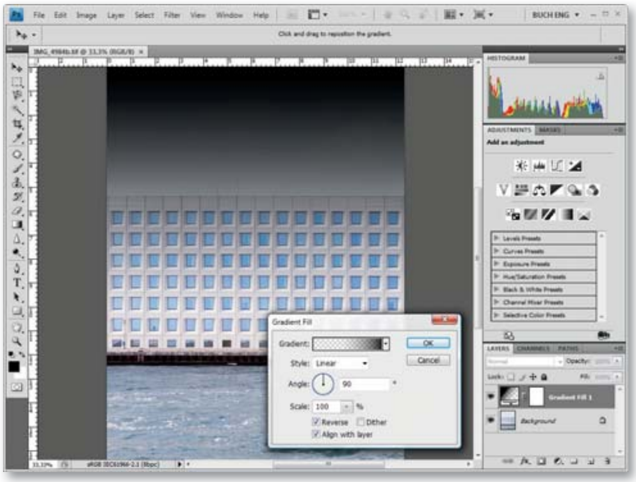


Figure 327

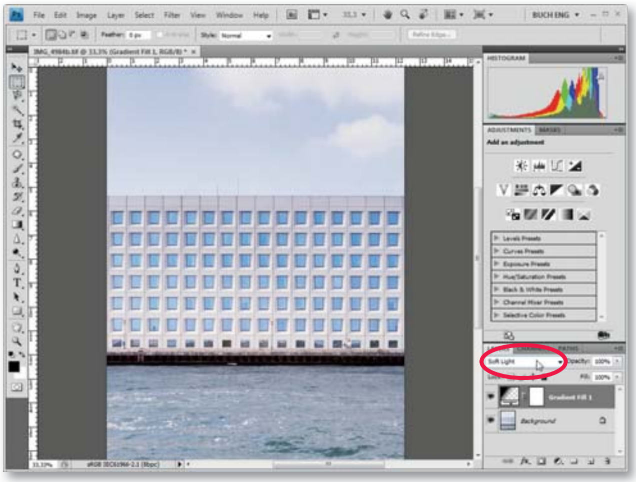


Figure 328

4.6.2 HDR from a Single RAW Image

Compared to JPEG files, RAW images have large reserves of information defining very bright and dark image areas. Therefore, software such as Photomatix Pro can be used to turn a RAW file into a pseudo-HDR image (figure 329).

We perform this conversion by opening the RAW image with the *File > Open* command. The previously described tone mapping procedure can be applied by clicking on *Tone Mapping*. Of course, it is a prerequisite that Photomatix Pro supports the camera-specific RAW file. (As an alternative, a converted 16-bit TIFF file can be used.) Needless to say, the result will be inferior to an HDR

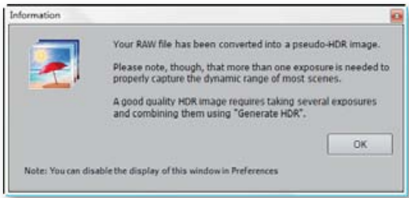


Figure 329

assembled from several images. The difference shows up as additional noise and blown-out highlights (figure 330).

On the other hand, Photoshop does not support creating an HDR image from a single RAW image. Photoshop simply refuses to proceed if only one file is selected in the *Merge to HDR* dialog box. But one can get around this by using the RAW converter to "develop" two separate images with different *exposure* settings and combine them in the usual manner into a DRI.

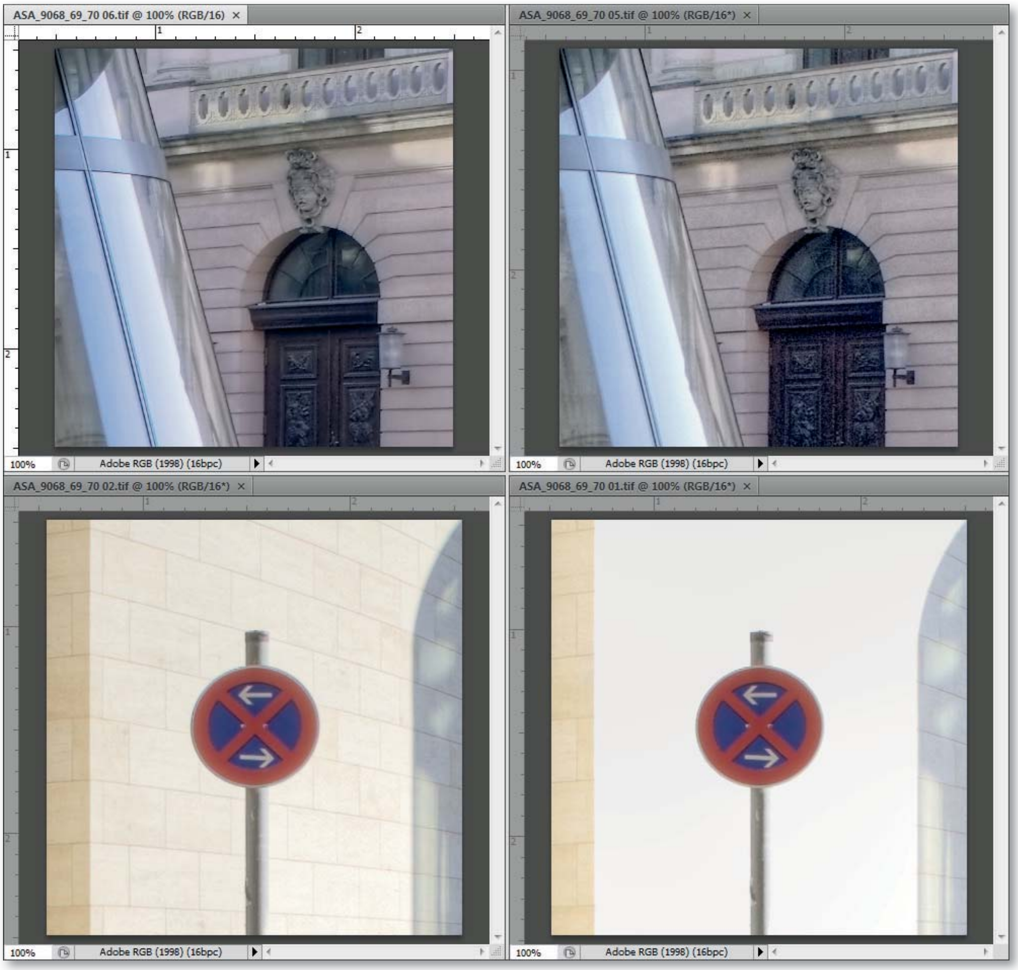


Figure 330: Comparison: HRD image taken from bracketing sequence (left) and pseudo-HDR from one shot (right)

4.6.3 Black and White Conversion in Photoshop

With the *Black & White* command in the *Image > Adjustments* menu, Photoshop CS3 and above offers new possibilities for converting color images into black and white. To make the effect reversible, the function should always be used in combination with an adjustment layer.

For this, we first create a layer with the *Layer > New Adjustment Layer > Black & White* command path and confirm the next dialog with *OK*. Alternatively, we can click on *Create new fill or adjustment layer* in the layer palette (figure 331). In the newly opened window, we use a slider for the individual adjustment of each color source. If the slider is positioned on the right side, the colors will be converted to a very bright gray. If the slider is on the left, the respective colors will be converted to a very dark gray (figure 332). For faster results, the various preset values can be used. For example, we can simulate typical color filters as they are used in analog black and white photography. We can also tint the image slightly, for instance in sepia, by activataing the *Tint* option and then adjusting the color. Since it is part of a layer, the black and white conversion can be reversed at any time without data loss.

Users of previous Photoshop versions must work with either the *Image > Adjustments > Desaturate* or *Image > Adjustments > Hue/Saturation* commands. In the latter, we set a saturation value of *–100*. Another alternative is the complex *Channel Mixer* that can be accessed by the *Image > Adjustments > Channel Mixer* command path. In the dialog box, the *Monochrome* option must be activated. In addition, the RAW converter can accomplish the black and white conversion.

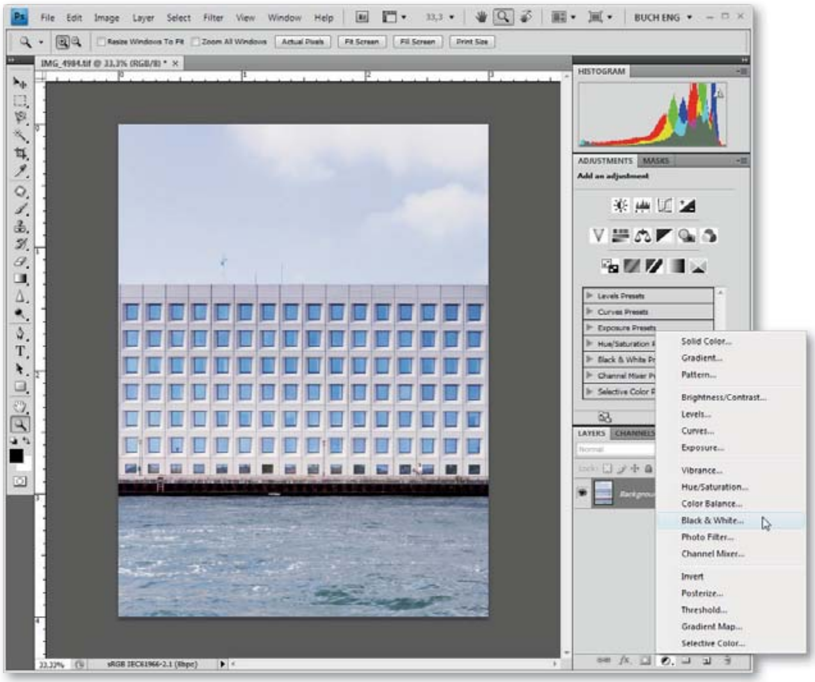


Figure 331

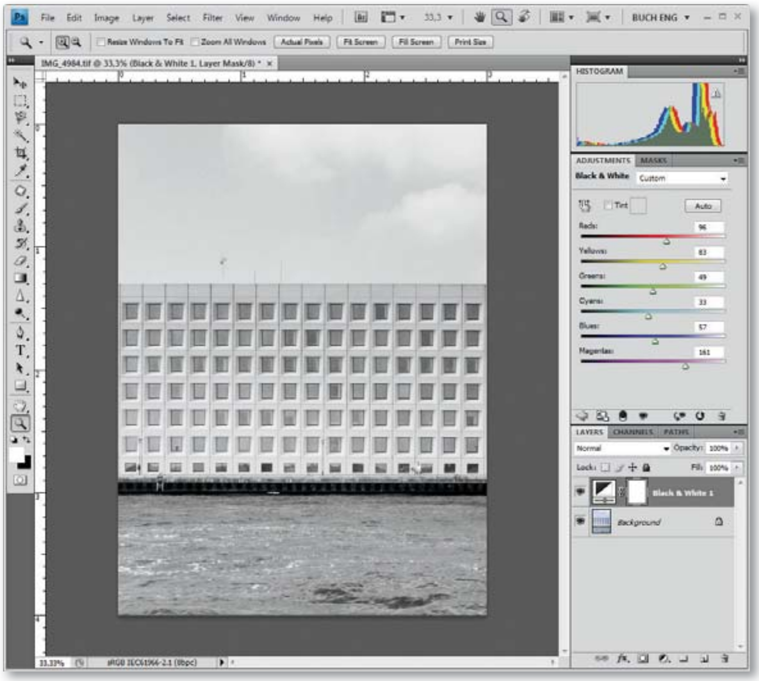


Figure 332

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For now, I wish my readers a lot of fun when experimenting with the inexhaustible subject matter of architectural photography.

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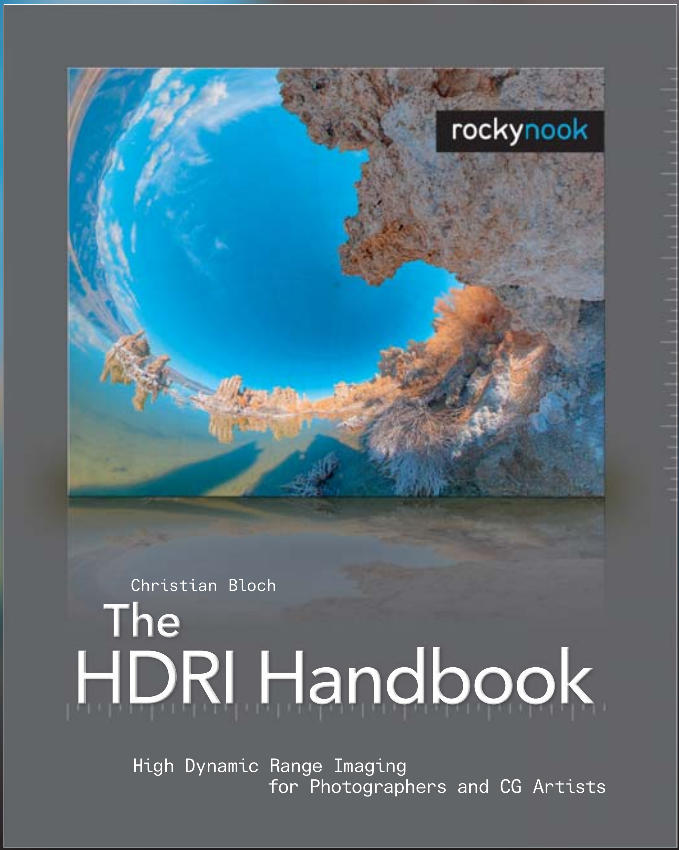

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